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Airfield Pavement Evaluation, Libby Army Airfield, Fort Huachuca, Arizona

Robert W. Grau, Patrick S. McCaffrey, Jr., and Dan D. Mathews

November 2002

Geotechnical and Structures Laboratory

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Final report

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Contents

Preface

The purpose of this report is to provide an assessment of load-carrying capacity and condition of airfield pavements at Libby Army Airfield (LAAF), Fort Huachuca, Arizona. This report provides data for the following:

a. Planning and programming pavement maintenance, repairs, and structural improvements.

b. Designing maintenance, repair, and construction projects.

c. Determining airfield operational capabilities.

d. Providing information for aviation flight publications and mission planning.

Users of information from this report include the installation's Directorate of Installation Support (DIS), engineering design agencies (U.S. Army Corps of Engineers), Airfield Commanders, U.S. Army Aeronautical Services Agency, and agencies assigned operations planning responsibilities. Information concerning aircraft inventory, passes, and operations shall not be released outside U.S. Government agencies. This report satisfies requirements for condition inspection and structural evaluation established in Army Regulation AR 420-72 (Headquarters, Department of the Army 2000) and supports airfield survey requirements identified in Army Regulation AR 95-2 (Headquarters, Department of the Army 1990).

The Army Airfield Pavement Evaluation Program is sponsored and technically monitored by the U.S. Army Corps of Engineers, Transportation Systems Center (CENWO-ED-TX) located in Omaha, NE. The U.S. Army Intelligence Center and Fort Huachuca provided funding for this investigation.

Personnel of the U.S. Army Engineer Research and Development Center (ERDC), Geotechnical and Structures Laboratory (GSL), Vicksburg, MS, prepared this publication. The findings and recommendations presented in this report are based upon pavement structural testing, data analysis, and condition survey work at LAAF. The required field testing was conducted in March 2002. The evaluation team consisted of Messrs. Robert W. Grau, Patrick S. McCaffrey, Jr., Ernest Berney, and Dan D. Mathews, Airfield and Pavements Branch (APB), GSL. Messrs. Grau, Mathews, and McCaffrey prepared this

publication under the supervision of Mr. Don R. Alexander, Chief, APB, Dr. Albert J. Bush III, Chief, Engineering Systems and Materials Division, and Dr. David W. Pittman, Acting Director, GSL.

At the time of publication of this report, Dr. James R. Houston was Director of ERDC, and COL John W. Morris III, EN, was Commander and Executive Director.

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Executive Summary

Personnel of the U.S. Army Engineer Research and Development Center (ERDC), Vicksburg, MS, conducted the field testing at Libby Army Airfield (LAAF), Fort Huachuca, Arizona, during March 2002. The structural capacity and physical properties of the pavement facilities were determined from nondestructive tests using a heavy weight deflectometer (HWD) and from measurements taken in previous studies. A visual inspection was also conducted to establish the condition of the airfield surface, which does not necessarily correspond to its load-carrying capacity.

The results of the tests and visual inspection reveal the following:

a. The primary airfield pavement facilities and their assigned Pavement Classification Number (PCN) are shown in Illustration 1. It should be noted that the PCN of the center 2742 m (9,000 ft) portion of R/W 08-26 is 74/R/B/W/T as compared to a PCN of 44/R/B/W/T for the 305 m (1,000 ft) ends of R/W 08-26.

b. The interior portion (R2C, R3C, and R4C) of the primary runway (R/W 08-26), Feature R13A of Runway 03-21, the Main Taxiway (T1A), plus five additional taxiway features (T2C, T3C, T4C, and T6A), are structurally adequate to withstand day-to-day mission (i.e., peacetime use) for 20 years. Two primary runway features (R1A and R5A); seven secondary runway features (R6A, R7C, R8C, R9A, R10A, R11C, and R12A); and seven taxiway features (T4B, T5B, T7B, T8B, T9B, T10B, and T11B) are structurally inadequate to withstand the projected traffic. All parking aprons with the exception of the West Ramp (A1B) are structurally inadequate to withstand the projected day-to-day mission traffic.

c. Installation Status Report (ISR) ratings for the airfield are shown in Illustration 2.

d. Approximately $415,000 (FY02) for repair is required to improve the surfaces of nine runway features, three taxiway features, and one apron feature to meet the minimum PCI requirements.

e. In planning structural improvements and/or reconstruction requirements, it should be recognized that UFC 3-260-02 (Headquarters, Departments

of the Army, Navy, and the Air Force 2001) specifies that the following pavements be rigid pavement: all paved areas on which aircraft or helicopters are regularly parked, maintained, serviced, or preflight checked, on hangar floors and access aprons; on runway ends (305 m (1,000 ft) of a Class B runway; primary taxiways for Class B runways; hazardous cargo, power check, compass calibration, warmup, alert, arm/disarm, holding, and washrack pads; and any other area where it can be documented that a flexible pavement will be damaged by jet blast or by spillage of fuel or hydraulic fluid.

f. Overloading the pavement facilities may shorten the life expectancy.

Additional details on structural capacity, surface condition, and work required to maintain and strengthen the airfield are contained in Chapters 2 and 3 of this report.

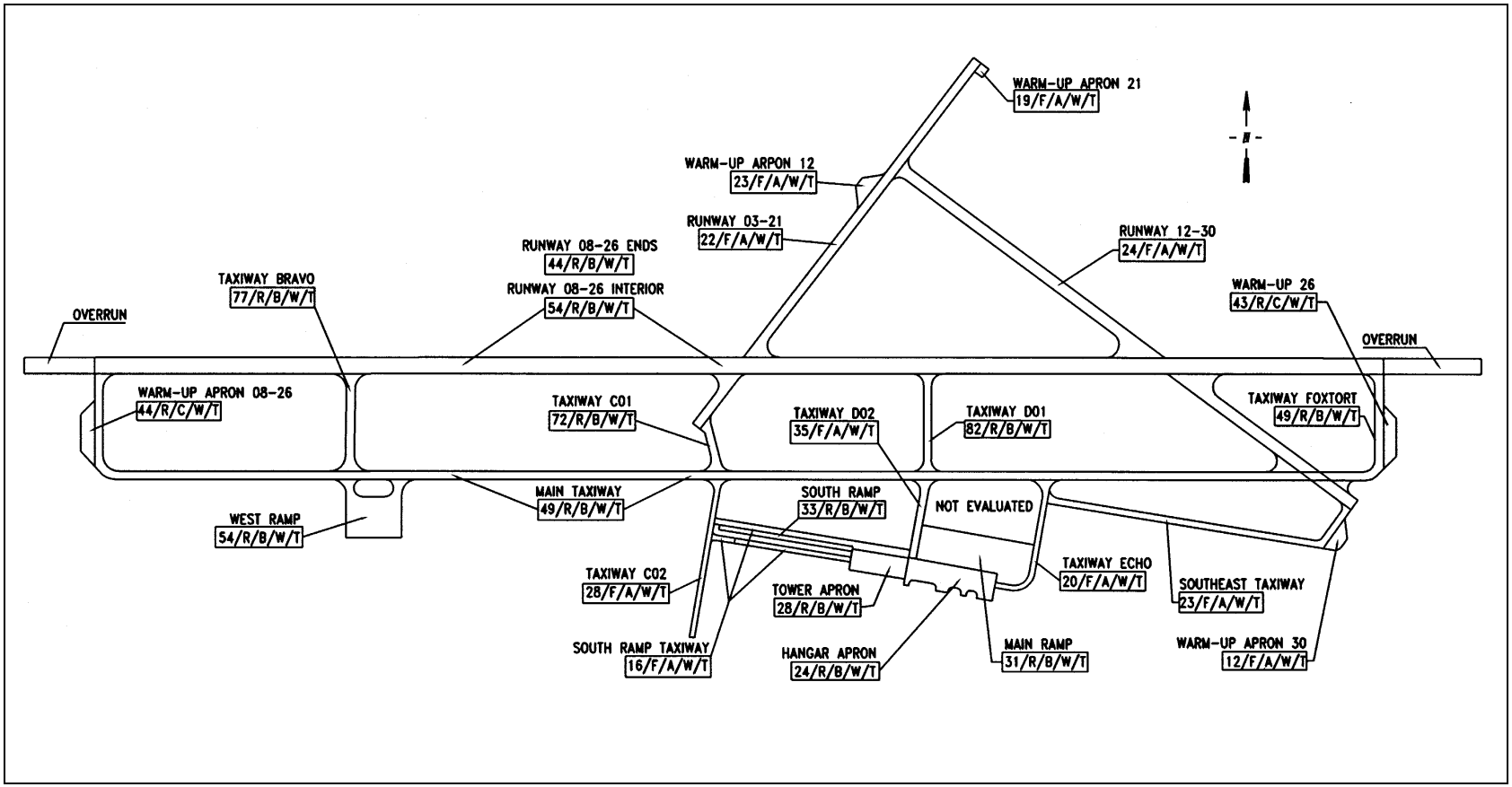


Illustration 1. Airfield Pavement Evaluation Chart (APEC)

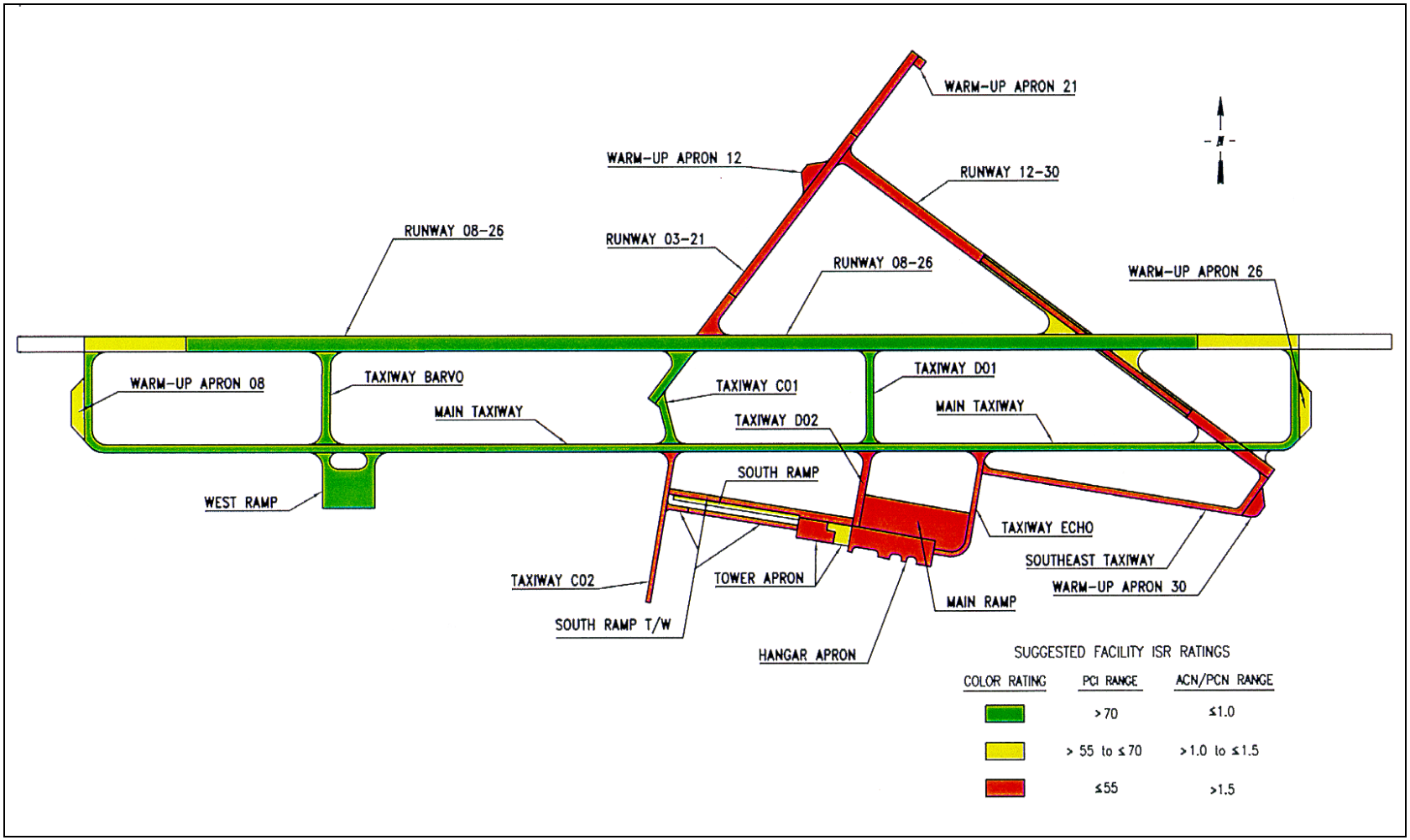


Illustration 2. Airfield pavement ISR ratings

1 Introduction

Background

In May 1982 the Department of the Army initiated a program to determine and evaluate the physical properties, the load-carrying capacity for various aircraft, and the general condition of the pavements at major U.S. Army Airfields (AAFs). This program was established at the request of the Major Army Commands (FORSCOM, TRADOC, and AMC). Headquarters, U.S. Army Corps of Engineers (CECW-EW) sponsors a program for periodic evaluation of Army Airfield facilities in accordance with Army Regulation AR 420-72 (Headquarters, Department of the Army 2000). All Category 1 AAFs and instrumented U.S. Army Heliports (AHPs) are included in the CECW-EW program. The evaluation of the airfield pavements was performed to determine the structural adequacy of the existing pavements to accommodate mission aircraft. Results of this evaluation were also used to identify maintenance, repair, and major repair work requirements and to help establish Installation Status Report (ISR) ratings. The U.S. Army Intelligence Center, Engineering and Fort Huachuca, Arizona provided funding for this investigation. Results of this investigation will provide current information for designing upgrades to the pavement facilities.

Objective and Scope

The primary objectives of this investigation were to determine the allowable aircraft loads and design traffic, and to identify maintenance, repair, and structural improvement needs for each airfield pavement feature. These objectives were accomplished by:

a. Obtaining records of day-to-day traffic operations from the installation Airfield Commander.

b. Conducting a structural evaluation of the airfield pavements in accordance with UFC 3-260-03 (Headquarters, Departments of the Army, Navy, and the Air Force 2001) using the nondestructive testing device.

c. Performing a condition survey to determine pavement distresses (type, severity and magnitude) in accordance with ASTM D 5340-93 and using analysis features of the Micro PAVER pavement management system.

The results of this study can be used to:

a. Provide preliminary engineering data for pavement design (Appendixes A and B).

b. Assist in identifying and forecasting maintenance and repair work, the preparation of long range work plans, and programming funds for the various work classification categories (Appendixes C and E).

c. Determine type and gross weights of aircraft that can operate on a given airfield feature without causing structural damage or shortening the life of the pavement structure (Appendix D).

d. Determine aircraft operational constraints as a function of pavement strength and surface condition (Appendix D).

e. Determine the need for structural improvements to sustain current levels of aircraft operations (Appendix D).

f. Summarize results for ISR ratings (Executive Summary).

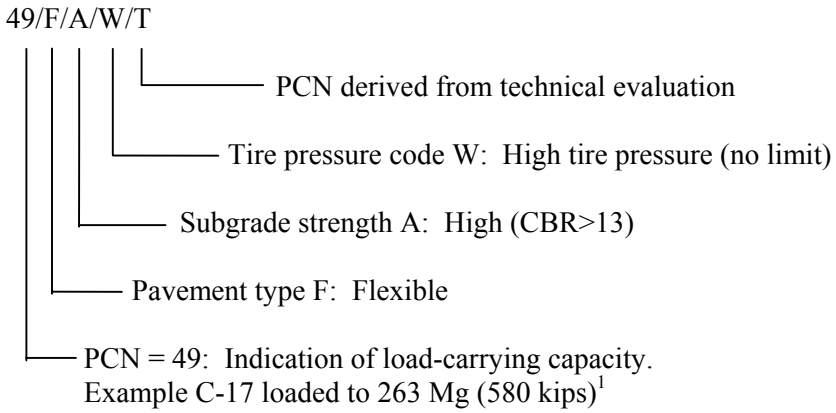
Chapter 2 of this report includes the results of the aircraft classification number-pavement classification number (ACN-PCN) analysis for use by U.S. Army Aeronautical Services Agency (USAASA), the airfield commander, and Deputy Chief of Staff for Operations and Plans (DCSOPS) personnel. Chapter 3 contains maintenance, repair, and structural improvement recommendations for use by DPW personnel and design agencies. Chapter 4 contains conclusions and recommendations in summary form. Detailed supporting data are provided in the appendices.

2 Pavement Load-Carrying Capacity

General

The load-carrying capacity is a function of the strength of the pavement, the gross weight of the aircraft, and the number of applications of the load. The method used to report pavement load-carrying capacity is the ACN-PCN system as adopted by the International Civil Aviation Organization (ICAO). The United States, as a participating member of ICAO, is required to report pavement strength in this format. The ACN-PCN format also provides the airfield evaluation information required by Army Regulation AR 95-2 (Headquarters, Department of the Army 1990).

The ACN and PCN are defined as follows: The ACN is a number which expresses the relative structural effect of an aircraft on both flexible and rigid pavements for specific standard subgrade strengths in terms of a standard single wheel load. The PCN is a number which expresses the relative load-carrying capacity of a pavement for a given pavement life in terms of a standard single wheel load. An example of a PCN five part code is as follows:



[1] Most of the dimensions and measurements reported were obtained in non-SI units. All such values have been converted using the conversion factors given in ASTM E 380.

The system works by comparing the ACN to the PCN. The PCN is a representation of the allowable load for a specified number of repetitions over the life of a pavement. The ACN is a representation of the load applied by an aircraft using the pavement. The system is structured such that an aircraft operating at an ACN (applied load) equal to or less than the PCN (allowable load) would comply with load restrictions established based on a specified design life for the pavement facility. If, however, the ACN (applied load) is greater than the PCN (allowable load), the specified design life will be shortened due to this overloading. Pavements can usually support some overload; however, pavement life is reduced. As a general rule, ACN/PCN ratios of up to 1.25 have minimal impact on pavement life. If the ACN/PCN ratio is between 1.25 and 1.50, aircraft operations should be limited to 10 passes, and the pavement inspected after each operation. Aircraft operations resulting in an ACN/PCN ratio over 1.50 should not be allowed except for emergencies.

Load-Carrying Capacity

The first step in determining the load-carrying capacity of the pavements at Libby (LAAF), Fort Huachuca, Arizona was to estimate the traffic to which the airfield will be subjected over the next 20 years. The traffic mix established for the airfield facilities is shown in Table A4. Based on this mix, the critical aircraft operating on the airfield was determined to be the C-17 aircraft at a design pass level of 5,628 for AC pavements and 7,509 for rigid pavements, as shown in Table D1. Using this traffic information, and results of the data analysis, the ACN value for the critical aircraft operating on the LAAF pavements was determined. The operational ACN for the airfield is 49/R/B/W/T for the rigid pavements and 49/F/A/W/T for the flexible pavements. See Table D5 for description of the five component ACN or PCN code. The numerical ACN values calculated for the critical aircraft operating on AC and PCC pavements on each of the four subgrade categories are presented in Table D2.

The critical PCN value for each airfield facility is presented in the Airfield Pavement Evaluation Chart (APEC) in Illustration 1. A summary of allowable loads and overlay requirements determined for the critical aircraft and its design pass level is shown in Table D3.

The number of passes of mobilization and contingency aircraft loadings that could be sustained by each facility is dependent on the ACN of the aircraft and the critical PCN of the facility. During wartime, many aircraft are allowed to carry heavier loads than during peacetime. This allowance means that the aircraft would have a higher ACN because of the higher loading and would cause more damage per pass than in peacetime. Also, under some contingency plans or during emergencies, heavier aircraft than those in the traffic table, see Table A4, could be considered for using the airfield pavements. These heavier aircraft would generally have higher ACN values and cause more damage than those normally using the airfield. The operational life of the pavement will be reduced if it is subjected to aircraft loadings having ACN values higher than the PCN of the

facility. An example of a procedure to determine the impact of mobilization and contingency aircraft operations is presented in Appendix D.

3 Recommendations for Maintenance, Repair, and Structural Improvements

General

Recommendations for maintenance, repair, and structural improvements are based on results from both the structural evaluation (Appendix D) and the pavement condition survey (Appendix C). Either or both the evaluation and/or the survey may indicate that a particular feature needs repair and/or improvement. If the pavement condition index (PCI) is below the required value contained in Army Regulation AR 420-72 (Headquarters, Department of the Army 2000), the pavement needs maintenance to improve its surface condition. If the ACN/ PCN ratio determined for the critical aircraft is greater than one, the pavement needs structural improvement. Where both evaluations indicate improvements are needed, the recommendations are made such that the repairs to the surface are those needed until the structural improvements can be made. If the structural improvements are made first, the surface repairs may not be necessary. The PCI, ACN/PCN, ISR rating, and recommended general maintenance alternatives for each feature are shown in Table 3-1, the Airfield Pavement Evaluation General Summary. Specific recommendations for maintenance are identified in Table 3-2.

The ISR is an information system designed to help the Army monitor some of the basic elements that affect the quality of life on installations. The ISR also supports decision-making by giving managers an objective means and a common methodology for comparing conditions across installations and across functional areas.

Recommendations for structural improvements have been defined in terms of overlays in this report. In some instances, overlays may not be the most cost effective or best engineering alternative for pavement strengthening. It should be noted that the overlay requirements shown in Table 3-2 were determined based on representative conditions at the time of testing and should be considered minimum values until verified by further investigation. These overlays should be used as a guide when programming funds for design projects. Prior to advertising an improvement project, a thorough pavement analysis and design should be

completed to select the most cost-effective improvement technique. All designs should be reviewed by the U.S. Army Corps of Engineers Transportation Systems Center to ensure that they are in accordance with current design criteria.

Recommended overlay thicknesses follow the criteria for minimum thicknesses contained in UFC 3-260-02 (Headquarters, Departments of the Army, Navy, and the Air Force 2001). Where calculated thicknesses are greater than the required minimum thickness, the values were rounded up to the next higher 13 mm (1/2-in.).

Maintenance and repair (M&R) recommendations are based on the changes needed to provide the minimum required PCI. AR 420-72 (Headquarters, Department of the Army 2000) states that installation airfield pavements shall be maintained to at least the following PCI:

All runways > 70
Primary taxiways 〈 60
Aprons and secondary taxiways > 55

Recommendations

Steps 1 through 5 of the flow chart shown in Figure 3-1 were used in determining the recommendations suggested in Table 3-2. The M&R alternatives suggested for the existing surfaces were selected from those listed for various distresses in flexible and rigid pavements shown in Tables 3-3 and 3-4, respectively. In many instances, the performance of a specific alternative depends upon the geographical location and expertise of local contractors. Therefore, it is suggested that the local DIS personnel review all recommendations. Local costs for the approved alternatives can then be used with the Micro PAVER program to obtain a reasonable cost estimate. All overlay, repair, or major repair should be in accordance with UFC 3-269-02 (Headquarters, Departments of the Army, Navy, and the Air Force 2001) that specifies that the following pavements be rigid pavement: all paved areas on which aircraft or helicopters are regularly parked, maintained, serviced, or preflight checked; on hangar floors and access aprons; on runway ends (305 m (1,000 ft)) of a Class B runway; primary taxiways for Class B runways; hazardous cargo, power check, compass calibration, warmup, alert, arm/disarm, holding, and washrack pads; and any other area where it can be documented that a flexible pavement will be damaged by jet blast or by spillage of fuel or hydraulic fluid.

The PCI was developed to determine maintenance and repair needs. If the PCI is low, maintenance or repair is needed to increase the PCI. If the PCI is low and the PCN is greater than the ACN, localized maintenance or repair will generally be an acceptable solution. Although these maintenance activities and repairs will improve the PCI to acceptable levels, they may not be the most cost-effective alternative. An overlay or other overall improvement may be more cost-effective than considerable localized maintenance or repairs. Certainly, if the current PCI is less than 25, overall improvements should be investigated.

When an overlay is recommended, the maintenance recommended is that which is needed to keep the pavement serviceable and safe and its PCI at the required minimum until the overlay is applied. The PCN is used to specify the structural capability of an airfield pavement. If the design aircraft's ACN is larger than the computed PCN, the pavement is structurally inadequate to support the mission traffic. If only repairs to improve the PCI are applied, the pavement could deteriorate quite rapidly. Structural improvements are required to increase the load-carrying capacity so that the PCN is greater than or equal to the ACN (aircraft load). Even if the PCI is high, structural improvements are necessary to support the mission traffic if the PCN is less than the design ACN.

The PCIs of nine runway features (R6A-R12A, R15C, and R16C), three taxiway features (T8B, T9B, and T10B), and one apron feature (A11B) fail to meet the minimum acceptable level outlined above. All features require crack and surface sealing to meet the minimum PCI requirement for runways, taxiways, and/or aprons. Based on the surface condition and high ACN/PCN ratio, complete replacement is recommended for A11B. The estimated cost to upgrade the remaining eleven features is approximately $415,000 FY03 dollars. An airfield pavements cost estimating guide for various maintenance and repair alternatives is shown in Table 3-4.

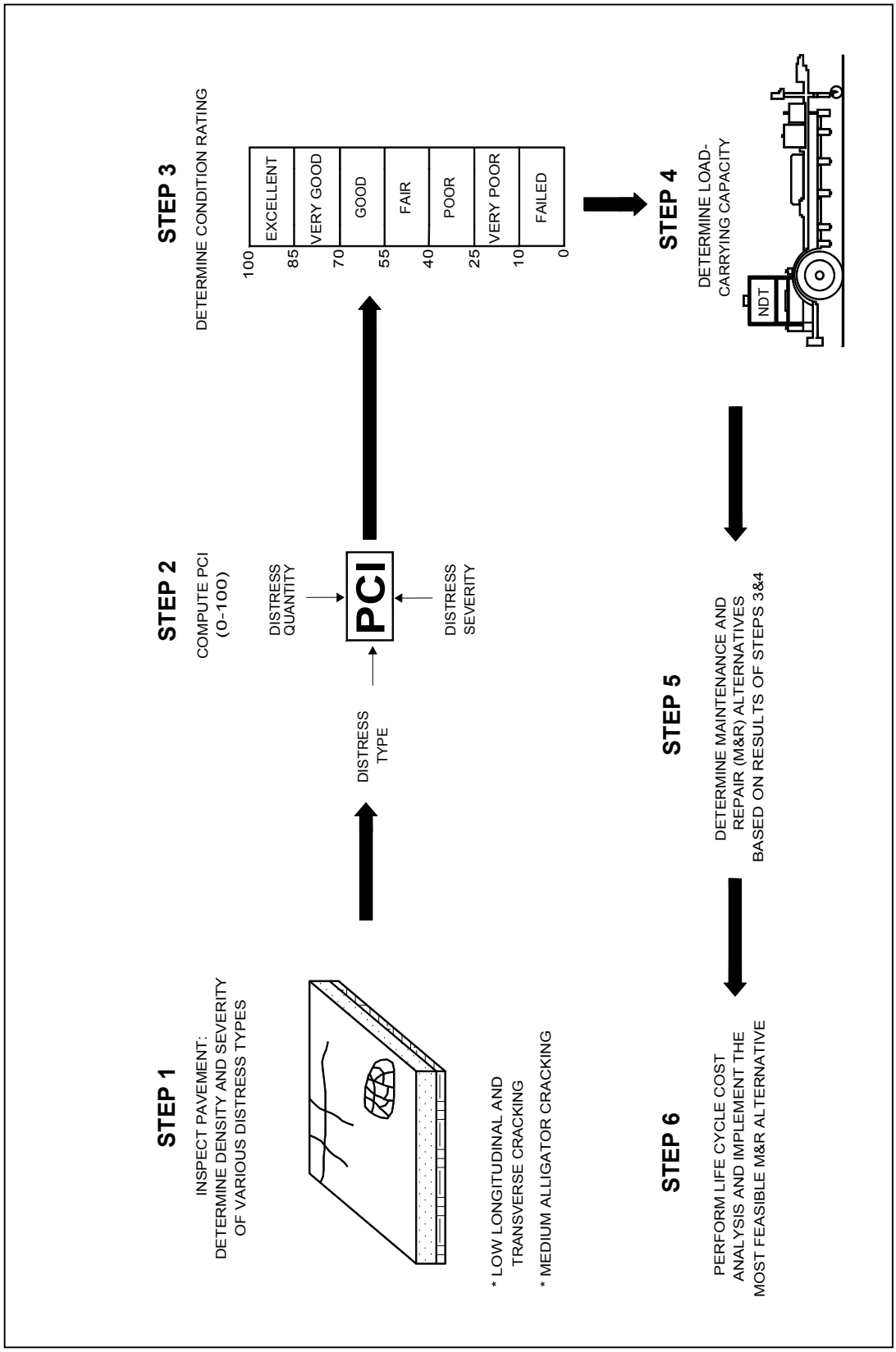


Figure 3-1. Flowchart for determination of maintenance and repair recommendations

Table 3-1
Airfield Pavement Evaluation General Summary

Pavement Feature	PCI	ACN/ PCN[2]	ISR Rating[3]	Work Classification[1]			
				Do Nothing	Maintenance	Repair	Major Repair
R1A	95	1.09	Amber			X	
R2C	98	0.78	Green	X			
R3C	99	0.66	Green	X			
R14C	100	NA[4]	Green	X			
R4C	94	1.00	Green	X			
R5A	97	1.09	Amber			X	
R6A	60	1.75	Red			X	
R7C	48	1.36	Red			X	
R15C	59	NA[4]	Amber			X	
R8C	65	1.23	Amber			X	
R16C	66	NA[4]	Amber			X	
R9A	62	2.04	Red			X	
R10A	67	2.23	Red			X	
R11C	66	1.81	Red			X	
R12A	66	2.04	Red			X	
R13A	99	0.92	Green	X			
T1A	94	1.00	Green	X			
T2C	100	0.64	Green	X			
T3C	100	0.67	Green	X			
T7B	66	1.75	Red			X	
T4C	99	0.60	Green	X			
T4B	72	2.23	Red			X	
T5B	64	2.45	Red			X	
T6A	91	1.00	Green	X			
T8B	49	2.82	Red			X	

(Sheet 1 of 2)

[1] Work is categorized for preliminary planning purposes only. Classification of work for administrative approval is an installation responsibility. Policy guidance for airfield pavements is provided in AR 420-72. *Maintenance* is usually performed on paved areas with a PCI greater than the minimum required and encompasses primarily the day-to-day routine work. Maintenance includes items such as sealing cracks and joints, repairing potholes, patching, repairing spalls, and applying rejuvenators. *Repair* is the restoration of a failed or rapidly deteriorating section of pavement to a good or excellent condition to such that it may be utilized for its designated purpose. Repair is usually applied to pavements with a PCI less than the minimum required. Examples are: recycling, overlays, slab replacement, and repairing drainage structures. *Major repair (construction)* relates to the alteration, extension, replacement, or upgrading of an existing facility. Major repair examples include: widening or lengthening a surfaced area, strengthening a pavement to support a new mission, and replacement of an entire facility.

[2] Determined for design aircraft.

[3] Based on the PCI and ACN/PCN ratio of the pavement feature.

[4] Features were not evaluated for load because the outside edges do not receive aircraft traffic.

Table 3-1 (Concluded)

Pavement Feature	PCI	ACN/ PCN[2]	ISR Rating[3]	Work Classification[1]			
				Do Nothing	Maintenance	Repair	Major Repair
T9B	59	3.06	Red			X	
T11B	69	2.35	Red				X
T10B	58	2.13	Red				X
A1B	88	0.90	Green	X			
A2B	77	1.75	Red			X	
A3B	93	1.48	Amber			X	
A4B	95	1.40	Amber			X	
A5B	94	1.58	Red			X	
A6B	91	2.04	Red				X
A7B	92	1.26	Amber			X	
A8B	97	1.23	Amber			X	
A9B	69	2.58	Red				X
A10B	69	2.13	Red			X	
A11B	25	4.08	Red				X

(Sheet 2 of 2)

[1] Work is categorized for preliminary planning purposes only. Classification of work for administrative approval is an installation responsibility. Policy guidance for airfield pavements is provided in AR 420-72. *Maintenance* is usually performed on paved areas with a PCI greater than the minimum required and encompasses primarily the day-to-day routine work. Maintenance includes items such as sealing cracks and joints, repairing potholes, patching, repairing spalls, and applying rejuvenators. *Repair* is the restoration of a failed or rapidly deteriorating section of pavement to a good or excellent condition to such that it may be utilized for its designated purpose. Repair is usually applied to pavements with a PCI less than the minimum required. Examples are: recycling, overlays, slab replacement, and repairing drainage structures. *Major repair (construction)* relates to the alteration, extension, replacement, or upgrading of an existing facility. Major repair examples include: widening or lengthening a surfaced area, strengthening a pavement to support a new mission, and replacement of an entire facility.

[2] Determined for design aircraft.

[3] Based on the PCI and ACN/PCN ratio of the pavement feature.

Table 3-2
Summary of Overlay and Maintenance Requirements for the Day-to-Day Traffic Operations

Feature	Area Sq m (sq yd)	Overlay Requirements, mm (in.)[1] AC	PCC Partial Bond	PCC with no Bond	Maintenance and Repair Alternatives for Existing Surfaces
Runway 08-26					
R1A[2]	13 935 (16,667)	NA	152 (6.0)	152 (6.0)	The PCI of this feature is above that required for runways. However, structural improvements are required to withstand the projected traffic.
R2C	6967 (8,333)	NA	0 (0.0)	0 (0.0)	None
R3C	62 708 (75,000)	NA	0 (0.0)	0 (0.0)	None
R14C[3]	62 708 (75,000)	--	--	--	None
R4C	6967 (8,333)	NA	0 (0.0)	0 (0.0)	None
R5A[2]	13 935 (16,667)	NA	152 (6.0)	152 (6.0)	Same as for R1A.
Runway 12-30					
R6A	9290 (11,111)	114 (4.5)	NA	See[4]	Clean all cracks, remove all loose material, and seal the entire area with an approved bituminous pavement sealer (see the PCASE on-line FACT SHEET web site for product guidance). Structural improvements are required to withstand the projected traffic.
R7C	12 542 (15,000)	64 (2.5)	NA	See[4]	Increase the PCI to an acceptable level by full-depth patching all rutted and alligator cracked areas and also by cleaning entire surface and then seal it with an approved bituminous pavement sealer (see the PCASE on-line FACT SHEET web site for product guidance). Structural improvements are required to withstand the projected traffic.
R15C[3]	12 542 (15,000)	--	--	--	Clean all cracks, remove all loose material, and seal the entire area with an approved bituminous pavement sealer (see the PCASE on-line FACT SHEET web site for product guidance).
R8C	3252 (3,889)	51 (2.0)	NA	See[4]	Same as for R15C. Structural improvements are required to withstand the projected traffic.
R16C[3]	3252 (3,889)	--	--	--	Same as for R15C.
R9A	9290 (11,111)	140 (5.5)	NA	See[4]	Same as for R6A
Runway 03-21					
R10A	6967 (8,333)	152 (6.0)	NA	See[4]	Same as for R6A.

(Sheet 1 of 4)

[1] For planning purposes only.
[2] UFC 3-260-02 (Headquarters, Departments of the Army, Navy, and the Air Force 2001) requires that the surface be concrete.
[3] Edges were not evaluated for load-carrying capacity therefore no overlays were calculated.
[4] Was not calculated because feature was evaluated as a flexible pavement.
[5] See TM 5-882-11/AFP 88-6, Chapter 7 (Headquarters, Departments of the Army and Air Force 1993) for guidance.

Table 3-2 (Continued)

Feature	Area Sq m (sq yd)	Overlay Requirements, mm (in.)[1] AC	PCC Partial Bond	PCC with no Bond	Maintenance and Repair Alternatives for Existing Surfaces
Runway 03-21					
R11C	13 935 (16,667)	114 (4.5)	NA	See[4]	Clean all cracks, remove all loose material, and seal the entire area with an approved bituminous pavement sealer (see the PCASE on-line FACT SHEET web site for product guidance). Structural improvements are required to withstand the projected traffic.
R12A	3832 (4,583)	140 (5.5)	NA	See[4]	Same as for R11C.
R13A	3902 (4,667)	NA	0 (0.0)	0 (0.0)	None.
Main Taxiway					
T1A[2]	85 422 (102,167)	NA	0 (0.0)	0 (0.0)	None.
Taxiway B					
T2C	6528 (7,808)	NA	0 (0.0)	0 (0.0)	None.
Taxiway C 01					
T3C	3553 (4,250)	NA	0 (0.0)	0 (0.0)	None.
Taxiway C 02					
T7B	5500 (6,578)	140 (5.5)	NA	See[4]	The PCI of this feature is above that required for taxiways. However it is recommended that the all cracks be cleaned, the loose material be removed, and then the entire area be sealed with an approved bituminous pavement sealer (see the PCASE on-line FACT SHEET web site for product guidance). Structural improvements are required to withstand the projected traffic.
Taxiway D 01					
T4C	6528 (7,808)	NA	0 (0.0)	0 (0.0)	None.
Taxiway D 02					
T4B	5170 (6,183)	191 (7.5)	NA	See[4]	The PCI of this feature is above that required for taxiways. However it is recommended that the all cracks be cleaned, the loose material be removed, and then the entire area be sealed with an approved bituminous pavement sealer (see the PCASE on-line FACT SHEET web site for product guidance). Structural improvements are required to withstand the projected traffic.

(Sheet 2 of 4)

[1] For planning purposes only.
[2] UFC 3-260-02 (Headquarters, Departments of the Army, Navy, and the Air Force 2001) requires that the surface be concrete.
[4] Was not calculated because feature was evaluated as a flexible pavement.
[5] See TM 5-882-11/AFP 88-6, Chapter 7 (Headquarters, Departments of the Army and Air Force 1993) for guidance.

Table 3-2 (Continued)

Feature	Area Sq m (sq yd)	Overlay Requirements, mm (in.)[1] AC	PCC Partial Bond	PCC with no Bond	Maintenance and Repair Alternatives for Existing Surfaces
Taxiway E					
T5B	7824 (9,358)	216 (8.5)	NA	See[4]	The PCI of this feature is above that required for taxiways. However it is recommended that the all cracks be cleaned, the loose material be removed, and then the entire area be sealed with an approved bituminous pavement sealer (see the PCASE on-line FACT SHEET web site for product guidance). Structural improvements are required to withstand the projected traffic.
Taxiway F					
T6A	9755 (11,667)	NA	0 (0.0)	0 (0.0)	None.
South Ramp Taxiway					
T8B	6804 (8,138)	241 (9.5)	NA	See[4]	Clean all cracks, remove all loose material, and seal the entire area with an approved bituminous pavement sealer (see the PCASE on-line FACT SHEET web site for product guidance). Structural improvements are required to withstand the projected traffic.
T9B	4831 (5,778)	267 (10.5)	NA	See[4]	The PCI of this feature is above that required for secondary taxiways. However it is recommended that the all cracks be cleaned, the loose material be removed, and then the entire area be sealed with an approved bituminous pavement sealer (see the PCASE on-line FACT SHEET web site for product guidance). Structural improvements are required to withstand the projected traffic.
T11B[2]	3987 (4,769)	NA	254 (10.0)	305 (12.0)	The PCI of this feature is above that required for taxiways. However, it is recommended that the joints be cleaned and sealed with a high-quality sealer[5]. Structural improvements are required to withstand the projected traffic.
Southeast Taxiway					
T10B	13 470 (16,111)	191 (7.5)	NA[4]	See[4]	Increase the PCI to an acceptable level by full-depth patching all alligator cracked areas and also by cleaning entire surface and then seal the surface with an approved bituminous pavement sealer (see the PCASE on-line FACT SHEET web site for product guidance). Structural improvements are required to withstand the projected traffic.
West Ramp					
A1B[2]	19 509 (23,333)	NA	0 (0.0)	0 (0.0)	None.
Tower Apron					
A2B[2]	5853 (7,000)	NA	216 (8.5)	262 (10.3)	Structural improvements are required to withstand the projected traffic. PCC reconstruction is recommended if this feature is to withstand the projected traffic.
A4B[2]	19 509 (23,333)	NA	152 (6.0)	191 (7.5)	Same as for A2B.

(Sheet 3 of 4)

[1] For planning purposes only.
[2] UFC 3-260-02 (Headquarters, Departments of the Army, Navy, and the Air Force 2001) requires that the surface be concrete.
[4] Was not calculated because feature was evaluated as a flexible pavement.
[5] See TM 5-882-11/AFP 88-6, Chapter 7 (Headquarters, Departments of the Army and Air Force 1993) for guidance.

Table 3-2 (Concluded)

Feature	Area Sq m (sq yd)	Overlay Requirements, mm (in.)[1] AC	PCC Partial Bond	PCC with no Bond	Maintenance and Repair Alternatives for Existing Surfaces
South Ramp					
A3B[2]	5142 (6,150)	NA	152 (6.0)	203 (8.0)	The PCI of this feature is above that required for aprons. However, it is recommended that the joints be cleaned and sealed with a high-quality sealer[5]. Structural improvements are required to withstand the projected traffic. PCC reconstruction is recommended if this feature is to withstand the projected traffic.
Main Ramp					
A5B[2]	29 264 (35,000)	NA	203 (8.0)	279 (11.0)	Structural improvements are required to withstand the projected traffic.
Hangar Apron					
A6B[2]	15 886 (19,000)	NA	254 (10.0)	318 (12.5)	The PCI of this feature is above that required for aprons. However, it is recommended that the joints be cleaned and sealed with a high-quality sealer[5]. Structural improvements are required to withstand the projected traffic. PCC reconstruction is recommended if this feature is to withstand the projected traffic.
Warm-up Apron 26					
A7B[2]	5342 (6,389)	NA	152 (6.0)	203 (8.0)	Structural improvements are required to withstand the projected traffic.
Warm-up Apron 08					
A8B[2]	5342 (6,389)	NA	152 (6.0)	178 (7.0)	Structural improvements are required to withstand the projected traffic.
Warm-up Apron 21					
A9B[2]	1747 (2,089)	216 (8.5)	NA	See[4]	Structural improvements are required to withstand the projected traffic. PCC reconstruction is recommended if this feature is to withstand the projected traffic.
Warm-up Apron 12					
A10B[2]	3252 (3,889)	179 (7.0)	NA	See[4]	Clean all cracks, remove all loose material, and seal the entire area with an approved bituminous pavement sealer (see the PCASE on-line FACT SHEET web site for product guidance). Structural improvements are required to withstand the projected traffic.
Warm-up Apron 30					
A11B[2]	2861 (3,422)	330 (13.0)	NA	See[4]	Increase the PCI to an acceptable level by milling off and replacing the existing AC. Structural improvements are required. PCC reconstruction is recommended if this feature is to withstand the projected traffic.

(Sheet 4 of 4)

[1] For planning purposes only.
[2] UFC 3-260-02 (Headquarters, Departments of the Army, Navy, and the Air Force 2001) requires that the surface be concrete.
[4] Was not calculated because feature was evaluated as a flexible pavement.
[5] See TM 5-882-11/AFP 88-6, Chapter 7 (Headquarters, Departments of the Army and Air Force 1993) for guidance.

Table 3-3
Maintenance, Repair, and Major Repair Alternatives for Airfield Pavements, Flexible

	Maintenance				Repair												Major Repair		
Distress Type	Seal Minor Cracks	Repair Pot-Holes	Partial-Depth Patching	Apply Rejuve-nators[1]	Seal Major Cracks	Full-Depth Patching	Micro-Surfacing	Slurry Seal[2]	Thin AC Overlays[3]	Surface Milling	Grooving	Porous Friction Course	Repair Drainage Facilities[4]	Surface Recycling	AC Structural Overlay[3]	PCC Structural Overlay	Remove Existing Surface and Reconstruct	Hot Recycle	Cold Recycle
Alligator cracking	L	M,H	M			M,H	L	L					L,M,H		M,H	M,H	H		
Bleeding										A				A			A	A	A
Block cracking	L,M			L	M,H		L,M	L						M	M,H			M,H	M,H
Corrugation			L,M			L,M,H	L,M		M,H	L,M							M,H		
Depression			L,M,H			M,H	L		M,H				L,M,H				H		
Jet blast				A		A	A		A										
Reflection cracking	L,M				M,H		L,M	L							M,H			H	
Longitudinal and transverse cracking	L,M				M,H		L,M	L							M,H			H	
Oil spillage			A			A			A	A				A			A	A	
Patching	L,M		M		M	M,H									M,H		H	H	
Polished aggregate							A	A	A	A	A	A		A					
Raveling/weathering		M,H		L,M		M	L,M	L	M,H	M				M,H		H	H	M,H	
Rutting			L,M			L,M,H	L						L,M,H		M,H	H	H	M,H	
Shoving			L			L,M				L,M							M,H	M,H	
Slippage cracking	A		A		A	A									A		A	A	
Swell			L,M			M,H				L,M			L,M,H				H		

Note: L = low severity level; M = medium severity level; H = high severity level; A = no severity levels for this distress.

[1] Not to be used on high speed areas due to increased skid potential.

[2] Not to be used on heavy traffic areas.

[3] Patch distressed areas prior to overlay.

[4] Drainage facilities to be repaired as needed.

Table 3-4
Maintenance, Repair, and Major Repair Alternatives for Airfield Pavements, Rigid

	Maintenance				Repair											Major Repair	
Distress Type	Seal Minor Cracks	Joint Seal	Partial Patch	Epoxy Patch	Seal Major Cracks	Full-Depth Patch	Under Sealing	Slab Grind-ing	Surface Milling	AC Overlay	PCC Overlay	Slab Replace-ment	Crack & Seat with AC Struc-tural Overlay	AC Overlay w/ Geotextile	Repair/ Install Surface/ Subsurface Drainage System[1]	PCC Recycling	Remove Existing PCC and Reconstruct
Blowup			L,M			M,H						H					
Corner break	L			M,H	M,H	M,H						H					
Longitudinal/ Transverse/ Diagonal cracking	L,M				M,H					H	H	H	M,H	H	L,M,H	H	H
D cracking	L		M,H		M,H	H						H				H	H
Joint seal damage		M,H															
Patching (small) <5 ft[2]	L,M		M	L,M	M,H	M,H						H					
Patching/utility cut	L,M		M	L,M	M,H	M,H						H					H
Popouts[2]				A						A	A						
Pumping	A	A			A		A								A		
Scaling/map cracking			M,H					M,H		M,H	M,H						
Fault/settlement		L,M					M,H	L,M	M,H						L,M,H		
Shattered slab	L				L,M					M,H	M,H	M,H		H	L,M,H	H	H
Shrinkage crack[3]																	
Spalling (joints)		L	L,M	L,M,H	M,H	M,H											
Spalling (corner)			L,M	L,M	M,H	M,H											

Note: L = low severity level; M = medium severity level; H = high severity level; A = no severity levels for this distress.

[1] Drainage facilities to be repaired as needed.

[2] Popouts normally do not require maintenance.

[3] Shrinkage cracks normally do not require maintenance.

Table 3-5
Airfield Pavements M&R Cost Estimating Guide

Item	Description	U/M	Unit Cost ($)					
			FY00	FY01	FY02	FY03	FY04	FY05
1	Remove/replace 10 in. PCC w/14 in. PCC including 6 in. base	SY	71.32	73.10	74.92	76.80	78.71	80.68
2	PCC Construction	SY-IN	3.64	3.73	3.87	3.92	4.02	4.12
3	Remove/replace 6 in. Bituminous Pavement w/14 in. PCC including 6 in. base	SY	65.38	67.01	68.69	70.41	72.17	73.97
4	Asphalt Concrete Overlay							
	-- Airfield Mix	TONS	50.34	51.60	52.89	54.21	55.57	56.95
		SY-IN	2.73	2.80	2.87	2.94	3.01	3.09
	-- Highway Mix	TONS	46.36	47.52	48.71	49.92	51.17	52.45
		SY-IN	2.52	2.58	2.65	2.71	2.78	2.85
5	Joint Resealing (JFR)	LF	2.14	2.19	2.25	2.30	2.36	2.42
6	Joint Resealing (NON - JFR)	LF	1.90	1.95	2.00	2.05	2.10	2.15
7	Crack Routing/Sealing (PCC)	LF	2.63	2.70	2.76	2.83	2.90	2.97
8	Neoprene Compression Joint Seal							
	-- Saw Cutting Only	LF	1.33	1.36	1.40	1.43	1.47	1.50
	-- Lubrication, Furnish and Install Compression Seal							
	-- 1/2-in. wide joint	LF	3.30	3.38	3.47	3.55	3.64	3.73
	-- 5/8-in. wide joint	LF	3.66	3.75	3.85	3.94	4.04	4.14
	-- 3/4-in. wide joint	LF	4.49	4.60	4.72	4.84	4.96	5.09
9	Spall Repairs (Epoxy-Bonded PCC)	SF	25.30	25.93	26.58	27.25	27.93	28.63
10	PCC Pavement Removal (To Base Course) T < 12 in.	SY-IN	1.01	1.04	1.06	1.09	1.12	1.15
11	PCC Pavement Removal (To Base Course) T > 12 in.	SY-IN	1.39	1.46	1.50	1.53	1.57	1.61
12	Asphalt Pavement Removal (to base course)	SY-IN	0.92	0.94	0.97	0.99	1.01	1.04
13	Base/Subgrade Removal	SY-IN	0.61	0.63	0.64	0.66	0.66	0.69
14	Asphalt Milling/Profiling/Grinding (Cold)							
	-- up to 1-in. depth	SY	1.56	1.60	1.64	1.68	1.72	1.77
	-- up to 2-in. depth	SY	2.26	2.32	2.37	2.43	2.49	2.55
	-- up to 3-in. depth	SY	2.38	2.44	2.50	2.56	2.62	2.69
	-- up to 4-in. depth	SY	2.50	2.56	2.63	2.69	2.76	2.83
	-- small difficult jobs (hard agg. etc.)	SY-IN	2.97	3.04	3.12	3.20	3.28	3.36
15	PC Concrete Grinding/Profiling (Normally 1/2 in. is max Feasible)	SY-IN	19.02	19.50	19.98	20.48	20.99	21.52
16	Heater-Scarification (3/4—in.) – rejuvenation	SY	1.32	1.35	1.39	1.42	1.46	1.49
17	Cold Recycling 6 in. AC with 4-in.-thick AC O/L	SY	17.46	17.90	18.34	18.80	19.27	19.75
18	Slurry Seal	SY	1.57	1.61	1.65	1.69	1.73	1.78

(Continued)

Table 3-5 (Concluded)

Item	Description	U/M	Unit Cost ($)					
			FY00	FY01	FY02	FY03	FY04	FY05
19	Micro-Surfacing	SY	2.26	2.32	2.37	2.43	2.49	2.55
20	Single Bituminous Surface Treatment	SY	1.90	1.95	2.00	2.05	2.10	2.15
21	Double Bituminous Surface Treatment	SY	2.75	2.82	2.89	2.96	3.03	3.11
22	Rubberized Coal Tar Pitch Emulsion Sand Slurry Surface Treatment	SY	1.72	1.76	1.81	1.85	1.90	1.94
23	Rubberized Coal Tar Pitch Emulsion (No Aggregate)	SY	1.13	1.16	1.19	1.22	1.25	1.28
24	Fog Seal	SY	0.77	0.79	0.81	0.83	0.85	0.87
25	Rubberized Asphalt Systems							
	-- Stress Absorbing Membrane (SAM) Interlayer	SY	4.40	4.51	4.62	4.74	4.86	4.98
	-- SAM Seal Coat (uncoated chips)	SY	4.64	4.76	4.87	5.00	5.13	5.25
	-- SAM Seal Coat (precoated chips)	SY	4.99	5.11	5.24	5.37	5.50	5.64
26	Reinforcing Fabric Membranes (including tack coat)	SY	2.47	2.53	2.60	2.66	2.73	2.79
27	Elastomeric Inlay installed in Existing PCC, Complete (2 ft Wide X 100 ft Long X 2 in. Deep)	EA	25.0K	25.6K	26.3K	26.9K	27.6K	28.3K
28	PC Concrete Inlay (20 ft X 120 ft X 12 in. in Asphalt Pavement)	EA	17.8K	18.2K	18.7K	19.2K	19.7K	20.2K
29	Runway Grooving							
	-- Asphalt Concrete Pavement	SY	1.90	1.95	2.00	2.05	2.10	2.15
	-- Portland Concrete Pavement	SY	4.16	4.26	4.37	4.48	4.59	4.71
30	Runway Rubber Removal (High Pressure Water Blasting Method)	SF	0.059	0.060	0.062	0.063	0.065	0.066
31	Paint Removal							
	-- Partial Removal (Remove only loose, flaking, or poorly bonded paint)	SF	0.059	0.060	0.062	0.063	0.065	0.066
	-- Complete Removal (Using High Pressure water with sand injection)	SF	0.69	0.70	0.72	0.74	0.76	0.78
32	Airfield Marking							
	-- Reflectorized	SF	0.46	0.47	0.48	0.50	0.51	0.53
	-- Non-Reflectorized	SF	0.26	0.27	0.27	0.28	0.29	0.29
33	Street Marking							
	-- Reflectorized	SF	0.33	0.34	0.35	0.36	0.37	0.38
	-- Non-Reflectorized	SF	0.21	0.22	0.22	0.23	0.24	0.24
34	Random Slab Replacement							
	-- 12 ft by 12 ft by 12-in. thick	EA	1.2K	1.2K	1.3K	1.3K	1.3K	1.4K
	-- 25 ft by 25 ft by 12-in. thick	EA	4.8K	4.9K	5.0K	5.2K	5.3K	5.5K
	-- 25 ft by 25 ft by 18-in. thick	EA	7.1K	7.3K	7.5K	7.6K	7.8K	8.0K
	-- 25 ft by 25 ft slab	SY-IN	5.56	5.70	5.84	5.99	6.14	6.29
35	Soil Cement Stabilization (10 percent by weight)	SY-IN	0.50	0.51	0.53	0.54	0.55	0.57

4 Conclusions

The maintenance and rehabilitation alternatives discussed in Chapter 3 and summarized in Table 3-2 should be performed as soon as possible to retain the full benefit of the structural capacity of the existing pavements. The M&R alternatives suggested for the existing surfaces were selected from the alternatives listed for the various distresses shown in Tables 3-3. In many instances the performance of a specific alternative is dependent upon local conditions and contractors.

The operational ACN for the airfield rigid pavement facilities is 49/R/B/W/T and for the flexible pavement facilities 49/F/A/W/T/. PCNs for each facility are shown in Illustration 1. ISR ratings based on the ACN/PCN ratios and the PCIs of each respective facility are shown in Illustration 2.

References

American Society of Testing and Materials. (1994). "Standard test method for airport pavement condition index surveys," Designation: D 5340-93, Philadelphia, PA.

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Headquarters, U.S. Army Corps of Engineers. (1991). "Engineering and design aircraft characteristics for airfield-heliport design and evaluation," Engineering Technical Letter ETL 1110-3- 394, U.S. Army Corps of Engineers, Washington, DC.

Headquarters, Departments of the Army and the Air Force. (1993). "Standard practice for sealing joints and cracks in rigid and flexible pavements," Technical Manual TM 5-822-11/AFP 88-6, Chap. 7, Washington, DC.

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_____. (2001b). "Pavement design for airfields," Unified Facilities Criteria, UFC 3-260-02, Washington, DC.

Appendix A
Background Data

Description of the Airfield

Libby Army Airfield (LAAF) is located at Fort Huachuca in Sierra Vista, AZ, approximately 97 km (60 miles) southeast of Tucson. Fort Huachuca is located in Cochise County, Arizona, and extends from the crest of the Huachuca Mountains [el 2562 n (8,406 ft) msl] to the San Pedro River approximately 112 m (3,700 ft) msl. Most of the post installations are built on coalesced alluvial fans slopping northeast to the San Pedro River. The conglomerate consists of gravel, cobbles, and boulders in a matrix of red sandy clay or clayey sand. The deposits are very well compacted and partially cemented by caliche. Graded deposits occur only in old stream channels and form a small percentage of the entire deposit. Quartzite, quartz monzonite, sandstone, and agate are the predominant rock materials in the conglomerate. Annual precipitation is approximately 356 mm (14 in.) and normally falls in a few severe storms causing sheet floods across the alluvial fans. The maximum and minimum temperatures were 41 °C and –17 °C (105 °F and 1 °F), respectively. Temperature and precipitation data are summarized in Table A1.

A layout of the airfield is shown in Figure A1. In March 2002 the airfield consisted of an east-west main runway (08-26), a northwest-southeast runway (12-30), a northeast-southwest runway (03-21), a main taxiway paralleling runway 08-26, several connecting taxiways, parking aprons adjacent to and/or near the tower and operations buildings, and warm-up aprons. Figure A1 presents a layout and identifies the facilities of the airfield. The identification and location of the various pavement features can be determined from Figure A2.

Previous Reports

Pertinent data for use in this evaluation were extracted from the previous reports listed below:

a. U.S. Army Engineer Waterways Experiment Station, "Airfield Pavement Evaluation, Libby Army Airfield, Fort Huachuca, Arizona," Miscellaneous Paper GL-95-11, December 1995, Vicksburg, MS.

b. U.S. Army Engineer Waterways Experiment Station, "Airfield Pavement Evaluation, Libby Army Airfield, Fort Huachuca, Arizona," Miscellaneous Paper GL-88-9, May 1988, Vicksburg, MS

c. U.S. Army, Los Angles District, "Deficiency Tabulation Report Libby Army Airfield Base," prepared under contract by Blanton & Co., July 1982, Tucson, AZ.

d. Arizona Air National Guard, "Analysis and Design, Southern Arizona Auxiliary Airfield, Libby Field, Fort Huachuca, Arizona," prepared under contract by Blanton & Co., July 1982, Tucson, AZ.

e. U.S. Army, Los Angles District, "Nondestructive Pavement investigation, Libby Army Airfield, Fort Huachuca, AZ," prepared by the Geotechnical Laboratory of the U.S. Army Engineer Waterways experiment Station, July 1982, Vicksburg, MS.

f. U.S. Army, Los Angles District, "Materials Investigation Report for Taxiway Rehabilitation at Libby Field, Fort Huachuca, AZ," March 1967, Los Angeles, CA.

g. U.S. Army, Los Angles District, "Runways and taxiways, Basis for Design, Army Electronic Proving Grounds, Libby Field," January 1961, Los Angeles, CA.

h. U.S. Army, Los Angeles District, "Materials Investigation Report for Proposed Improvements at Libby Field," November 1960, Los Angeles, CA.

i. U.S. Army, Los Angeles District, "Report on Wind Erosion Control for Proposed Improvements at Libby Field," November 1960, Los Angeles, CA. .

j. U.S. Army, South Pacific Division Laboratory, "Report of Soil Tests, CBR Studies on Typical Barrow and Subgrade Materials, Libby Field," September 1960, Sausalito, CA. .

k. U.S. Army Engineer Waterways Experiment Station, "Army Airfield Pavement Evaluation, Libby Army Airfield, Fort Huachuca, AZ," Technical Report No. 3-466, Report II, January 1959, Vicksburg, MS.

l. U.S. Army, Los Angeles District, "Materials Investigation Report for Concrete Apron at Libby Field, Fort Huachuca, AZ," March 1956, Los Angeles, CA.

Design and Construction History

An Aviation Engineer Battalion constructed the original pavements at LAAF in 1952. At this time the airfield pavements consisted of an AC runway and PCC apron. Upgrading of the pavements, including new construction and strengthening of existing facilities, was performed at various periods from 1956 through 1995. Design wheel loads were not available for the pavements constructed in 1952. In 1961 Runways 12-30 and 03-21, their associated warm-up aprons, and Taxiways Charlie 01 and Echo were constructed. These pavements were designed to support a single-wheel load of 9 979 kg (22,000 lb) with a tire pressure of 0.69 MPa (100 psi). The reconstruction or strengthening in 1985 and 1986 was designed for 50,000 passes of the C-141 aircraft loaded to 146 500 kg (323,000 lb). Failures occurred in the AC portion of the 1985 runway and reconstruction consisting of PCC over a drainable base was completed in 1995. Also at this time edge drains were installed along the edges of Features A7B, A8B, T1A, T2C, T3C, T4C, T6A, R6A, R7C, and R13A. Table A2 presents the history of the major construction activities at LAAF. Table A3 contains a summary of the physical property data of the various pavement features.

Traffic History

The principal aircraft using the airfield are the C-5A, C-17, C-130, and KC-135. Airfield operations personnel requested that the structural analysis of the pavement facilities be based on 2,200 annual passes of these principal aircraft. They also estimated that the C-130 aircraft applied approximately 60 percent of the traffic and the remaining 40 percent was evenly divided between the C-5A, C-17, and KC-135. The structural evaluation of the pavement facilities was based on the frequencies of operation for these four aircraft shown in Table A4. The rotary-wing and light fixed-wing aircraft using the pavements at LAAF have little adverse effects on the structural integrity of the pavements.

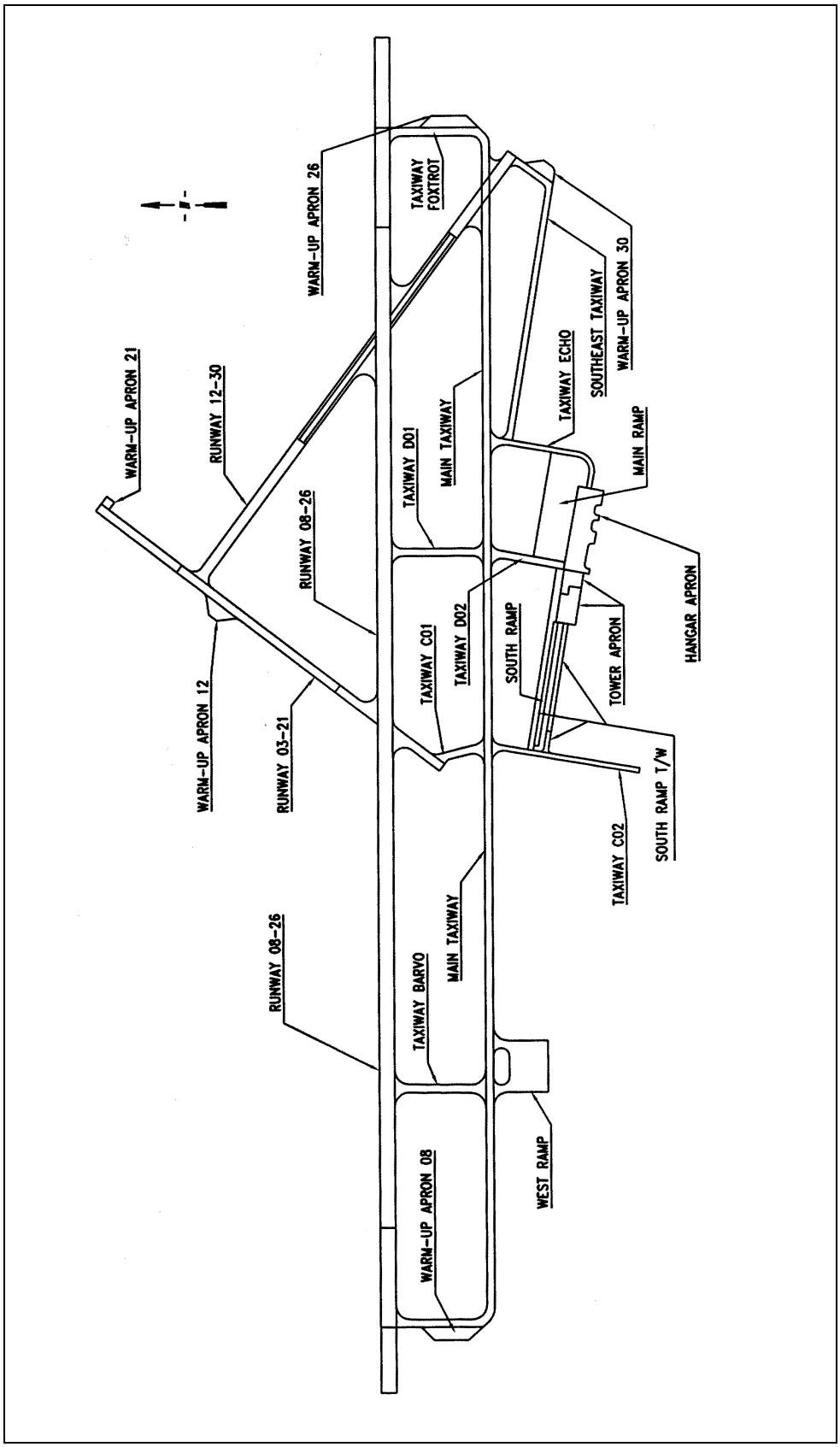

Figure A1. Layout of airfield and facility identifications

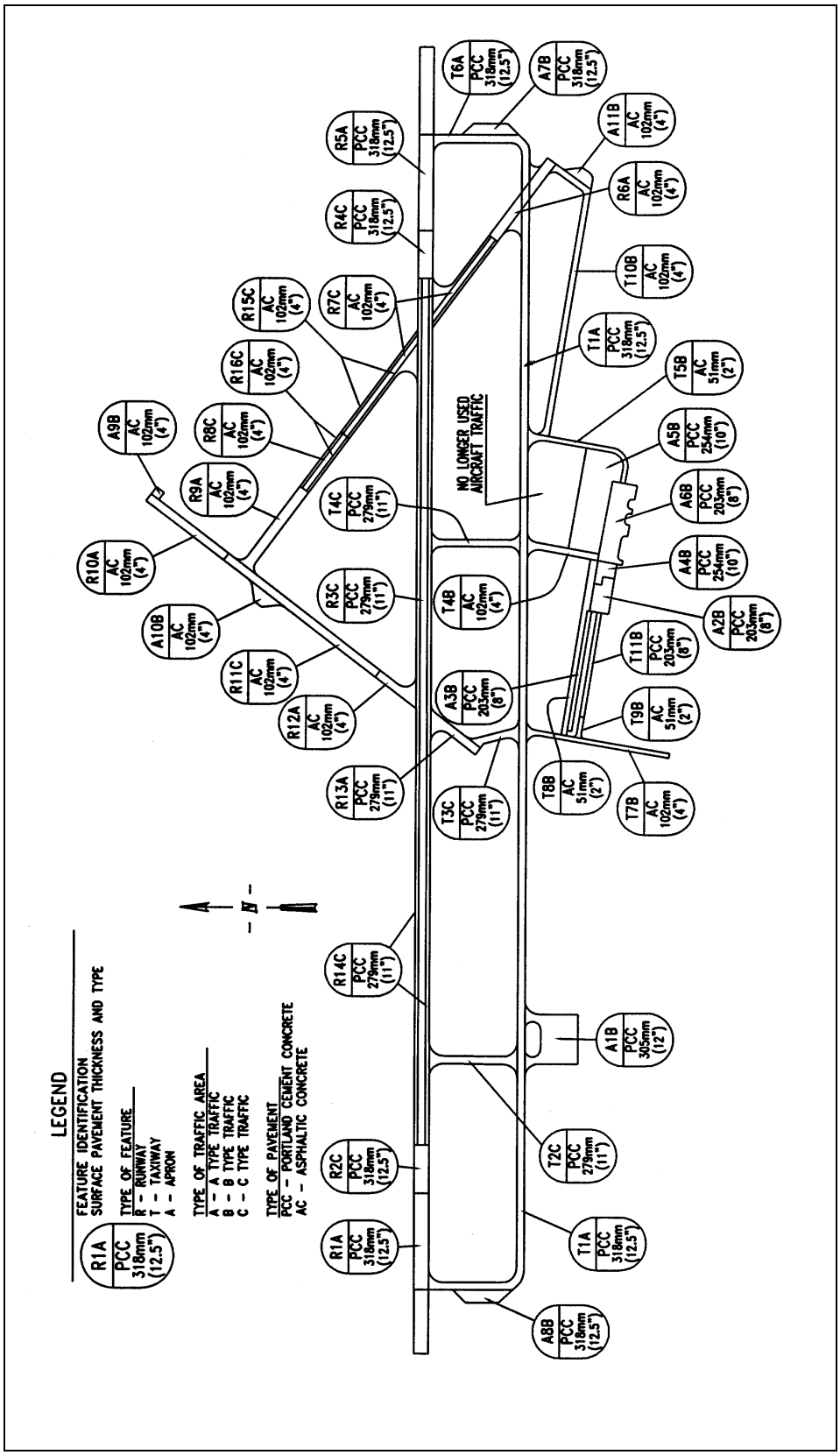

Figure A2. Pavement feature identification and location

Table A1
Climatological Data Summary

	J	F	M	A	M	J	J	A	S	O	N	D	ANN	YRS REC
Temperature, °C (°F)														
Highest	27 (81)	29 (84)	30 (86)	33 (92)	38 (100)	40 (104)	42 (107)	38 (101)	38 (100)	34 (94)	30 (86)	26 (79)	42 (107)	25
Mean Daily Max	14 (58)	17 (62)	19 (66)	23 (74)	27 (81)	33 (91)	32 (89)	31 (87)	29 (85)	25 (77)	19 (66)	15 (59)	24 (75)	25
Mean	9 (48)	11 (52)	14 (57)	18 (65)	23 (73)	28 (83)	27 (81)	26 (79)	24 (76)	19 (67)	14 (57)	10 (50)	19 (66)	25
Mean Daily Min	3 (38)	5 (41)	7 (45)	11 (51)	16 (60)	21 (69)	21 (70)	20 (68)	18 (65)	13 (56)	8 (46)	4 (39)	12 (54)	25
Lowest	-13 (9)	-11 (13)	-8 (18)	-4 (24)	1 (34)	7 (44)	14 (58)	13 (55)	6 (42)	-1 (30)	-8 (18)	-13 (8)	-13 (8)	25
Precipitation, mm (in.)														
Mean	28 (1.1)	18 (0.7)	18 (0.7)	8 (0.3)	5 (0.2)	8 (0.3)	99 (3.9)	89 (3.5)	48 (1.9)	30 (1.2)	13 (0.5)	28 (1.1)	381 (15.0)	25
Snowfall, mm (in.)														
Mean	20 (0.8)	33 (1.3)	38 (1.5)	8 (0.3)	0	0	0	0	0	3 (0.1)	13 (0.5)	38 (1.5)	152 (6.0)	25
Relative Humidity, %														
Mean														
0600 LST	64	60	54	44	39	34	64	70	64	57	56	60	56	25
1500 LST	35	28	24	19	17	16	34	38	32	27	27	33	28	

Source of data: www.afccc.af.mil/climo Fort Huachuca/Libby AAF, Arizona
# Denotes less than 1 mm (0.05 in.).

Table A2
Construction History

Pavement Facility (Feature)	Surface Pavement Thickness, mm (in.)	Surface Pavement Type	Construction Date	Agency
Fixed-Wing Facilities				
Runway 08-26				
(R1A, R2C, R4C and R5A)	318 (12.5)	PCC	1985	ANG[1]
(R3C and R14C)	279 (11.0)[2]	PCC	1995	CE[1]
Runway 12-30				
(R6A, R7C, and R15C)	102 (4.0)[2]	AC	1985	ANG
(R8C, R9A, and R16C)	51 (2.0)	AC	1964	CE
(R8C, R9A, and R16C)	51 (2.0)[3]	AC	1987	DEH[1]
Runway 03-21				
(R10A, R11C)	51 (2.0)	AC	1961	CE
(R12A)	102 (4.0)[2]	AC	1985	CE
(R10A, R11C)	51 (2.0)[3]	AC	1987	DEH
(R13A)	279 (11.0)[2]	PCC	1995	CE
Main Taxiway				
(T1A)	318 (12.5)	PCC	1985	ANG
Taxiway Bravo				
(T2C)	102 (4.0)	AC	1985	ANG
	279 (11.0)[2]	PCC	1995	CE
Taxiway Charlie 01				
(T3C)	279 (11.0)[2]	PCC	1995	CE
Taxiway C 02				
(T7B)	51 (2.0)	AC	1961	CE
	51 (2.0)[3]	AC	1987+	CE
Taxiway Delta 01				
(T4C)	279 (11.0)	PCC	1995	CE
Taxiway Delta 02				
(T4B)	102 (4.0)	AC	1985	CE
Taxiway Echo				
(T5B)	51 (2.0)	AC	1961	CE
	51 (2.0)[2]	AC	1986	CE
Taxiway Foxtrot				
(T6A)	318 (12.5)[2]	PCC	1985	ANG
South Ramp Taxiway				
(T8B)	51 (2.0)	AC	1975	CE
(T9B)	51 (2.0)	AC	1975	CE
(T11B)	203 (8.0)	PCC	1975	CE
Southeast Taxiway				
(T10B)	102 (4.0)[2]	AC	1987+	DEH
West Ramp				
(A1B)	305 (12.0)	PCC	1985	ANG
Tower Apron				
(A2B)	203 (8.0)	PCC	1952	CE
(A4B)	254 (10.0)[2]	PCC	1987+	DEH
South Ramp				
(A3B)	203 (8.0)	PCC	1975	CE
Main Ramp				
(A5B)	254 (10.0)	PCC	1986	CE
Hangar Apron				
(A6B)	203 (8.0)	PCC	1956	CE
Warm-up Apron 26				
(A7B)	318 (12.5)	PCC	1985	ANG
Warm-up Apron 08				
(A8B)	318 (12.5)	PCC	1985	ANG

(Continued)

[1] CE = U.S. Army Corps of Engineers; ANG = Air National Guard; DEH = Directorate of Engineering and Housing.
[2] Reconstruction.
[3] Overlay pavement.

Table A2 (Concluded)

Pavement Facility (Feature)	Surface Pavement		Construction Date	Agency
	Thickness, mm (in.)	Type		
Fixed-Wing Facilities				
Warm-up Apron 21 (A9B)	51 (2.0) 51 (2.0)[2]	AC AC	1961 1987+	CE[1] DEH[1]
Warm-up Apron 12 (A10B)	51 (2.0) 51 (2.0)[2]	AC AC	1961 1987+	CE DEH
Warm-up Apron 30 (A11B)	51 (2.0)	AC	1961	CE

[1] CE = U.S. Army Corps of Engineers; ANG = Air National Guard; DEH = Directorate of Engineering and Housing.
[2] Reconstruction.
[3] Overlay pavement.

Table A3
Summary of Physical Property Data

Facility					Overlay Pavement			Pavement			Base			Subbase			Subgrade	
Feature	Identification	Length m (ft)	Width m (ft)	General Condition PCI	Thickness[1] mm (in.)	Description	Flex. Str.[1] MPa (psi)	Thickness[1] mm (in.)	Description	Flex. Str.[1] MPa (psi)	Thickness[1] Mm (in.)	Description	Modulus[2] MPa (psi)	Thickness[1] mm (in.)	Description	Modulus[2] MPa (psi)	Description	Modulus[2] MPa (psi)
Fixed-Wing Facilities																		
R1A	Runway 08-26	305 (1,000)	46 (150)	Excellent				318(12.5)	PCC	4.7 (680)	102 (4.0)	Crushed Aggregate (GP)	170 (24,594)				Clayey Sand (SC)	170 (24,594)
R2C	Runway 08-26	152 (500)	46 (150)	Excellent				318(12.5)	PCC	4.7 (680)	102 (4.0)	Crushed Aggregate (GP)	183 (26,543)				Clayey Sand (SC)	183 (26,543)
R3C	Runway 08-26	2743 (9,000)	23 (75)	Excellent				279 (11.0)	PCC	5.9 (850)	152 (6.0)	Rapid Draining Material (GP)	259 (37,577)	102 (4.0)	Dense Graded (GW)	259 (37,577)	Clayey Sand (SC)	259 (37,577)
R14C	Runway 08-26 (Runway Edges)	2743 (9,000)	23 (75)	Excellent				279 (11.0)	PCC	5.9 (850)	152 (6.0)	Rapid Draining Material (GP)	--[3]	102 (4.0)	Dense Graded (GW)	--[3]	Clayey Sand (SC)	--[3]
R4C	Runway 08-26	152 (500)	46 (150)	Excellent				318(12.5)	PCC	4.7 (680)	102 (4.0)	Crushed Aggregate (GP)	79 (11,431)				Clayey Sand (SC)	79 (11,431)
R5A	Runway 08-26	305 (1,000)	46 (150)	Excellent				318(12.5)	PCC	4.7 (680)	102 (4.0)	Crushed Aggregate (GP)	168 (24,327)				Clayey Sand (SC)	168 (24,327)
R6A	Runway 12-30	305 (1,000)	30 (100)	Good				102 (4.0)	AC		152 (6.0)	Stabilized aggregate	383 (55,491)	152 (6.0)	Select barrow	203 (29,478)	Clayey Sand (SC)	203 (29,478)
R7C	Runway 12-30	823 (2,700)	15 (50)	Fair				102 (4.0)	AC		152 (6.0)	Stabilized Aggregate	399 (57,799)	152 (6.0)	Select barrow	182 (26,429)	Clayey Sand (SC)	182 (26,429)
R15C	Runway 12-30 (Runway Edges)	823 (2,700)	15 (50)	Good				102 (4.0)	AC		152 (6.0)	Stabilized Aggregate	--[3]	152 (6.0)	Select barrow	--[3]	Clayey Sand (SC)	--[3]
R8C	Runway 12-30	213 (700)	15 (50)	Good	51 (2.0)	AC		51 (2.0)	AC		152 (6.0)	Stabilized Aggregate	379 (54,946)	152 (6.0)	Select barrow	200 (29,015)	Clayey Sand (SC)	200 (29,015)
R16C	Runway 12-30 (Runway Edges)	213 (700)	15 (50)	Good	51 (2.0)	AC		51 (2.0)	AC		152 (6.0)	Stabilized Aggregate	--[3]	152 (6.0)	Select barrow	--[3]	Clayey Sand (SC)	--[3]

(Sheet 1 of 4)

[1] Values from original construction data and/or measurements recorded in previous investigations.
[2] Modulus values used for the structural analysis of the pavement features.
[3] Structural analysis was not performed on runway edges.

Table A3 (Continued)

Facility					Overlay Pavement			Pavement			Base			Subbase			Subgrade	
Feature	Identification	Length m (ft)	Width m (ft)	General Condition PCI	Thickness[1] mm (in.)	Description	Flex. Str.[1] MPa (psi)	Thickness[1] mm (in.)	Description	Flex. Str.[1] MPa (psi)	Thickness[1] Mm (in.)	Description	Modulus[2] MPa (psi)	Thickness[1] mm (in.)	Description	Modulus[2] MPa (psi)	Description	Modulus[2] MPa (psi)
Fixed-Wing Facilities (Continued)																		
R9A	Runway 12-30	305 (1,000)	51 (100)	Good	51 (2.0)	AC		51 (2.0)	AC		152 (6.0)	Stabilized Aggregate	349 (50,665)	152 (6.0)	Select Barrow	204 (29,530)	Clayey Sand (SC)	204 (29,530)
R10A	Runway 03-21	305 (1,000)	23 (75)	Good	51 (2.0)	AC		51 (2.0)	AC		152 (6.0)	Stabilized Aggregate	335 (48,527)				Clayey Sand (SC)	165 (23,883)
R11C	Runway 03-21	609 (2,000)	23 (75)	Good	51 (2.0)	AC		51 (2.0)	AC		152 (6.0)	Stabilized Aggregate	299 (43,424)				Clayey Sand (SC)	139 (20,186)
R12A	Runway 03-21	178 (550)	23 (75)	Good	51 (2.0)	AC		51 (2.0)	AC		152 (6.0)	Stabilized Aggregate	352 (51,096)				Clayey Sand (SC)	178 (25,870)
R13A	Runway 03-21	171 (560)	23 (75)	Excellent				279 (11.0)	PCC	5.9 (850)	152 (6.0)	Rapid Draining Material (GP)	245 (35,508)	102 (4.0)	Dense Graded Aggregate (GW)	245 (35,508)	Clayey Sand (SC)	245 (35,508)
T1A	Main Taxiway	3737 (12,260)	23 (75)	Excellent				318 (12.5)	PCC	4.9 (665)	102 (4.0)	Crushed Aggregate (GP)	218 (31,563)				Clayey Sand (SC)	218 (31,563)
T2C	Taxiway B	286 (937)	23 (75)	Excellent				279 (11.0)	PCC	5.9 (850)	152 (6.0)	Rapid Draining Material (GP)	329 (47,708)	102 (4.0)	Dense Graded (GW)	329 (47,708)	Clayey Sand (SC)	329 (47,708)
T3C	Taxiway C 01	155 (510)	23 (75)	Excellent				279 (11.0)	PCC	5.9 (850)	152 (6.0)	Stabilized Aggregate	245 (35,517)	102 (4.0)	Dense Graded (GW)	245 (35,517)	Clayey Sand (SC)	245 (35,517)
T7B	Taxiway C 02	451 (1,480)	12 (40)	Good				102 (4.0)	AC		203 (6.0)	Stabilized Aggregate	397 (57,603)				Clayey Sand (SC)	216 (31,312)
T4C	Taxiway D 01	286 (937)	23 (75)	Excellent				279 (11.0)	PCC	5.9 (850)	152 (6.0)	Rapid Draining Material (GP)	392 (56,845)	102 (4.0)	Dense Graded Aggregate (GW)	392 (56,845)	Clayey Sand (SC)	392 (56,845)
T4B	Taxiway D 02	226 (742)	23 (75)	Very good				102(4.0)	AC		152 (6.0)	Stabilized Aggregate	349 (50,633)				Clayey Sand (SC)	176 (25,505)

(Sheet 2 of 4)

[1] Values from original construction data and/or measurements recorded in previous investigations.
[2] Modulus values used for the structural analysis of the pavement features.
[3] Structural analysis was not performed on runway edges.

Table A3 (Continued)

Facility					Overlay Pavement			Pavement			Base			Subbase			Subgrade	
Feature	Identification	Length m (ft)	Width m (ft)	General Condition PCI	Thickness[1] mm (in.)	Description	Flex. Str.[1] MPa (psi)	Thickness[1] mm (in.)	Description	Flex. Str.[1] MPa (psi)	Thickness[1] Mm (in.)	Description	Modulus[2] MPa (psi)	Thickness[1] mm (in.)	Description	Modulus[2] MPa (psi)	Description	Modulus[2] MPa (psi)
Fixed-Wing Facilities (Continued)																		
T5B	Taxiway E	324 (1,123)	23 (75)	Good				51 (2.0)	AC		152 (6.0)	Stabilized Aggregate	345 (50,075)				Clayey Sand (SC)	173 (25,070)
T6A	Taxiway F	427 (1,400)	23 (75)	Excellent				318(12.5)	PCC	5.4 (785)	102 (4.0)	Crushed Aggregate (GP)	168 (24,433)				Clayey Sand (SC)	168 (24,433)
T8B	South Ramp Taxiway	558 (1,831)	12 (40)	Fair				51(2.0)	AC		152 (6.0)	Stabilized Aggregate	350 (50,720)				Clayey Sand (SC)	176 (25,573)
T9B	South Ramp Taxiway	69 (227)	12 (40)	Good				51 (2.0)	AC		152 (6.0)	Stabilized Aggregate	332 (48,165)				Clayey Sand (SC)	163 (23,611)
T11B	South Ramp Taxiway	576 (1,073)	12 (40)	Good				203(8.0)	PCC	4.8 (700)	102 (4.0)	Clayey Gravelly Sand (SC)	114 (16,589)				Clayey Sand (SC)	114 (16,589)
T10B	Southeast Taxiway	884 (2,900)	15 (50)	Good				102(4.0)	AC		152 (6.0)	Stabilized Aggregate	354 (51,297)				Clayey Sand (SC)	179 (26,029)
A1B	West Ramp	160 (525)	122 (400)	Excellent				305 (12.0)	PCC	4.8 (700)	102 (4.0)	Crushed Aggregate (GP)	329 (47,787)				Clayey Sand (SC)	329 (47,787)
A2B	Tower Apron	96 (315)	61 (200)	Very good				203(8.0)	PCC	4.1 (600)	102 (4.0)	Clayey Gravelly Sand (SC)	297 (43,034)				Clayey Sand (SC)	297 (43,034)
A3B	South Ramp	375 (1,230)	13 (45)	Excellent				203(8.0)	PCC	4.9 (735)	102 (4.0)	Clayey Gravelly Sand (SC)	257 (37,307)				Clayey Sand (SC)	257 (37,307)
A4B	Tower Apron	91 (300)	15 (200)	Excellent				254(10.0)	PCC	4.8 (700)	102 (4.0)	Clayey Gravelly Sand (SC)	379 (54,901)				Clayey Sand (SC)	379 (54,901)
A5B	Main Ramp	320 (1,050)	91 (300)	Excellent				254(10.0)	PCC	3.8 (550)	356 (14.0)	Stabilized aggregate	231 (33,546)				Clayey Sand (SC)	231 (33,546)

(Sheet 3 of 4)

[1] Values from original construction data and/or measurements recorded in previous investigations.
[2] Modulus values used for the structural analysis of the pavement features.

Table A3 (Concluded)

Facility					Overlay Pavement			Pavement			Base			Subbase			Subgrade	
Feature	Identification	Length m (ft)	Width m (ft)	General Condition PCI	Thickness[1] mm (in.)	Description	Flex. Str.[1] MPa (psi)	Thickness[1] mm (in.)	Description	Flex. Str.[1] MPa (psi)	Thickness[1] Mm (in.)	Description	Modulus[2] MPa (psi)	Thickness[1] mm (in.)	Description	Modulus[2] MPa (psi)	Description	Modulus[2] MPa (psi)
Fixed-Wing Facilities (Concluded)																		
A6B	Hangar Apron	283 (930)	61 (200)	Excellent				203 (8.0)	PCC	4.1 (600)	102 (4.0)	Clayey Gravelly Sand (SC)	165 (23,993)				Clayey Sand (SC)	165 (23,993)
A7B	Warm-up Apron 26	177 (580)	38 (125)	Excellent				318(12.5)	PCC	4.5 (650)	102 (4.0)	Crushed Aggregate (GP)	128 (18,603)				Clayey Sand (SC)	128 (18,603)
A8B	Warp-up Apron 08	177 (580)	38 (125)	Excellent				318(12.5)	PCC	4.5 (650)	102 (4.0)	Crushed Aggregate (GP)	145 (20,966)				Clayey Sand (SC)	145 (20,966)
A9B	Warp-up Apron 21	38 (125)	30 (100)	Good	51 (2.0)	AC		51 (2.0)	AC		152 (6.0)	Stabilized Aggregate	278 (40,317)				Clayey Sand (SC)	162 (23,543)
A10B	Warp-up Apron 12	122 (400)	43 (140)	Good	51 (2.0)	AC		51 (2.0)	AC		152 (6.0)	Stabilized Aggregate	357 (51,805)				Clayey Sand (SC)	182 (26,433)
A11B	Warp-up Apron 30	104 (340)	15 (50)	Very poor	51 (2.0)	AC		51 (2.0)	AC		152 (6.0)	Stabilized Aggregate	327 (47,413)				Clayey Sand (SC)	159 (23,049)

(Sheet 4 of 4)

[1] Values from original construction data and/or measurements recorded in previous investigations.
[2] Modulus values used for the structural analysis of the pavement features.

Table A4
Traffic Data (January thru December 2000)

Aircraft	Weight kg (lb)	12-month Period	20-Year Departures
C-17	263 080 (580,000)	293	5,860
C-130	70 370 (155,000)	1,320	26,400
C-5A	349 126 (769,000)	293	5,860
KC-135	136 926 (301,600)	293	5,860

Appendix B
Tests and Results

Tests Conducted

The pavements were evaluated based on the results from nondestructive testing utilizing a heavy weight deflectometer (HWD). The test procedures and results are discussed below.

Nondestructive Tests

Test equipment

Nondestructive tests (NDT) were performed on the pavements with the Dynatest model 8081 (HWD). The HWD is an impact load device that applies a single-impulse transient load of approximately 25- to 30-millisecond duration. With this trailer-mounted device, a dynamic force is applied to the pavement surface by dropping a weight onto a set of rubber cushions which results in an impulse loading on an underlying circular plate 300 mm (11.8 in.) in diameter in contact with the pavement. The applied force and the pavement deflections, respectively, are measured with load cells and velocity transducers. The drop height of the weights can be varied from 0 to 399 mm (15.7 in.) to produce a force from 0 to approximately 222 kN (50,000 lb). The system is controlled with a laptop computer that also records the output data. Velocities were measured and deflections computed at the center of the load plate (D1) and at distances of 305 (12), 610 (24), 914 (36), 1219 (48), 1524 (60), and 1828 mm (72 in.) (D2 - D7) from the center of the load plate.

Test procedure

On runways and taxiways, deflection basin measurements were made at 30-m (100-ft) intervals on alternate sides of the centerline along the main gear wheel paths. The tests were performed on 3- to 4-m (10- to 12-ft) offsets alternating left and right of the centerline. The parking aprons were tested in a grid pattern of approximately 30-m (100-ft) intervals or at locations that were

selected to ensure that adequate NDT were performed per feature for evaluation purposes. Lines along which the NDT were conducted are indicated in Figure B1. At each test location, pavement deflection measurements were recorded at force levels of approximately 67, 122, 157, or 222 kN (15,000, 25,000, 35,000, or 50,000 lb). Impulse stiffness modulus (ISM) values were then calculated based on the slope of the plot of impulse load versus deflection at the first sensor (D1), for the maximum force level.

NDT Analysis

The NDT results or ISM data for each facility were grouped according to different pavement features. Figures B2 through B22 graphically show the ISM test results. A representative basin for each feature was determined using the computerized Layered Elastic Evaluation Program (LEEP). Table B1 shows the representative basins for each feature as determined from the NDT.

Representative basins were used to determine section modulus values of the various layers within the pavement structure in each feature. Deflection basins were input to a multi-layered, linear elastic backcalculation program to determine the surface, base, and subgrade modulus values. The program determines a set of modulus values that provide the best fit between a measured (NDT) deflection basin and a computed (theoretical) deflection basin. Table B2 presents a summary of the backcalculated modulus values based on the representative basins for each pavement section.

Modulus values for AC surface layers can be determined using three methods: (a) use the surface temperature at the time of testing and the previous 5-day mean air temperature, (b) backcalculate the modulus values using the FWD deflection basins, or (c) determine the design modulus from past temperature data. All three methods of determining the AC modulus values are described in UFC 3-260-03 (Headquarters, Departments of the Army, the Air Force, and the Navy April 2001). All pavements have been evaluated for a design life of 20 years. The modulus of an AC layer is temperature dependent; therefore, seasonal variation is considered by using a design modulus based on historical temperature data. From the climatological table (Table A1), an average daily maximum temperature of 33 ºC (91 ºF) and an average daily mean of 28 ºC (83 ºF) for June (hottest month) were used in determining the design AC modulus. For a loading frequency of 2 Hz for taxiways and aprons, the design AC modulus is 520 MPa (75,491 psi) for a loading frequency of 10 Hz for the runway, the design AC modulus is 981 MPa (142,253 psi). The design AC modulus along with the backcalculated values for the base and subgrade layers were used to determine the structural capacity of the AC pavement features.

Modulus values for PCC pavements can be backcalculated using the FWD deflection basins or a design modulus for the PCC can be used. In the evaluation of a rigid pavement, the design modulus should be used for the PCC layer along with the backcalculated values for the subgrade layers. The backcalculated PCC modulus values shown in Table B2 are within the default range of 17 000 to

69 000 MPa (2,500,000 to 10,000,000 psi) recommended in UFC 3-260-03 (Headquarters, Departments of the Army, Navy, and the Air Force 2001). This manual also recommends a modulus of 34 474 MPa (5,000,000 psi) for a PCC layer in good condition.

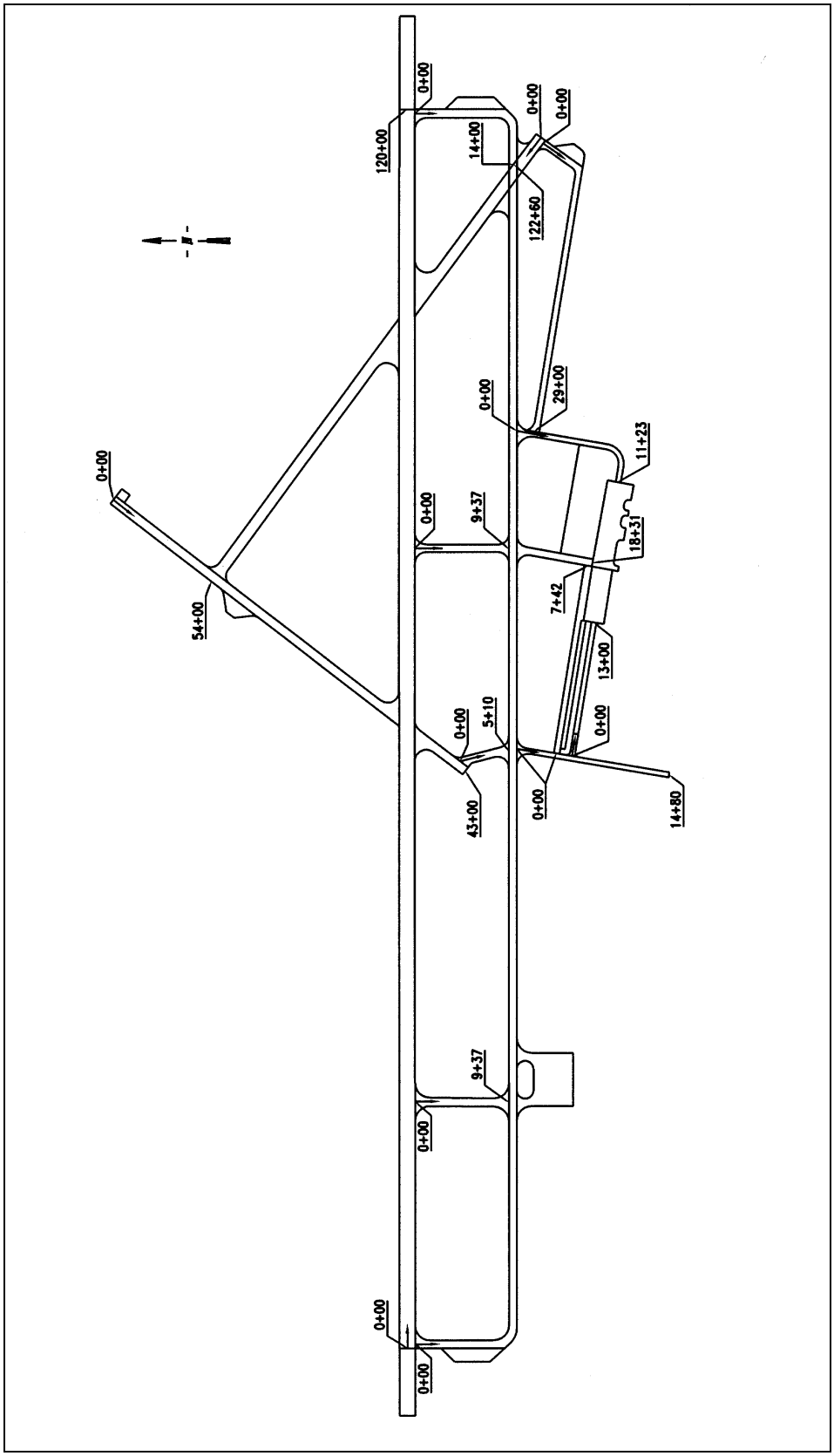

Figure B1. NDT test locations/direction

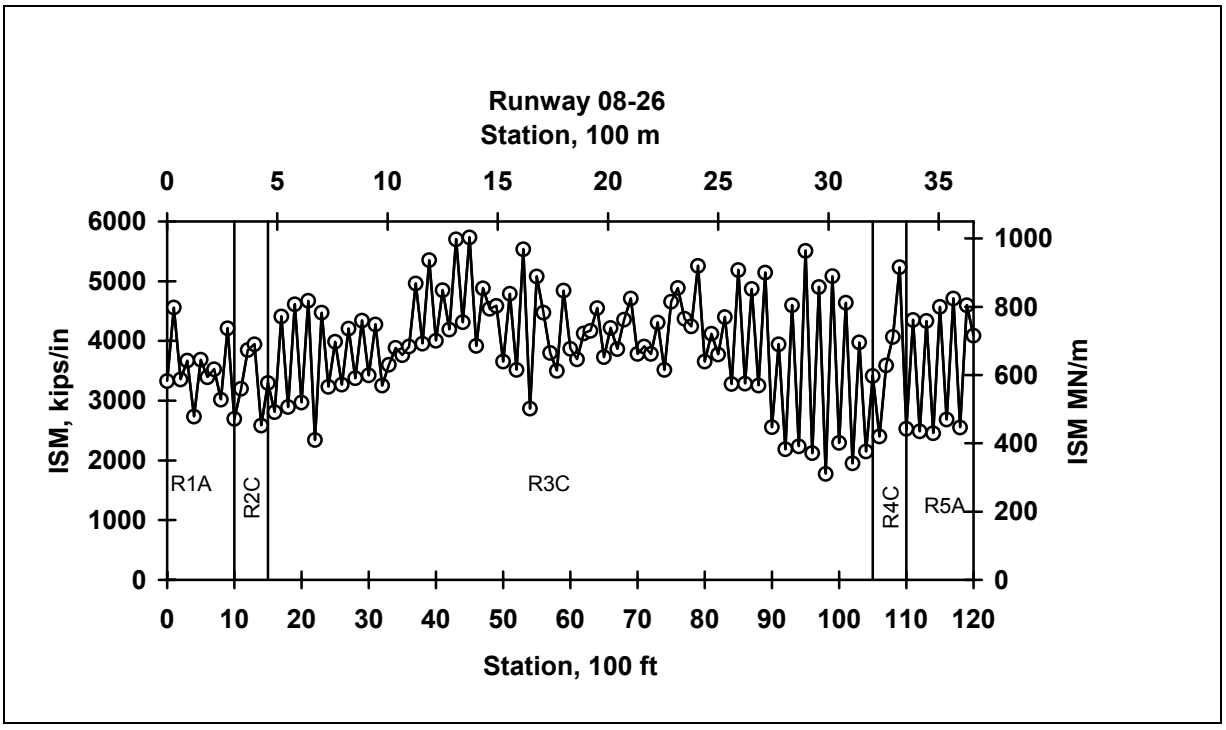

Figure B2. ISM profile, Runway 08-26, Features R1A thru R5A

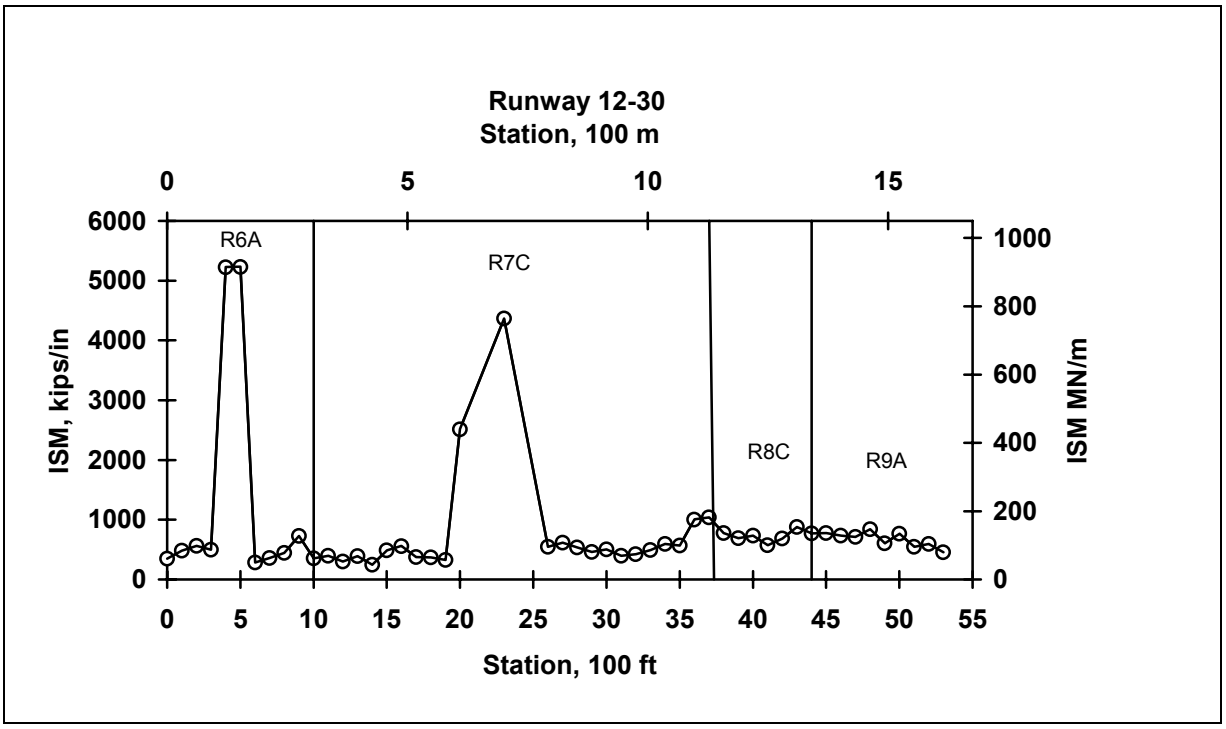

Figure B3. ISM profile, Runway 12-30, Features R6A thru R9A

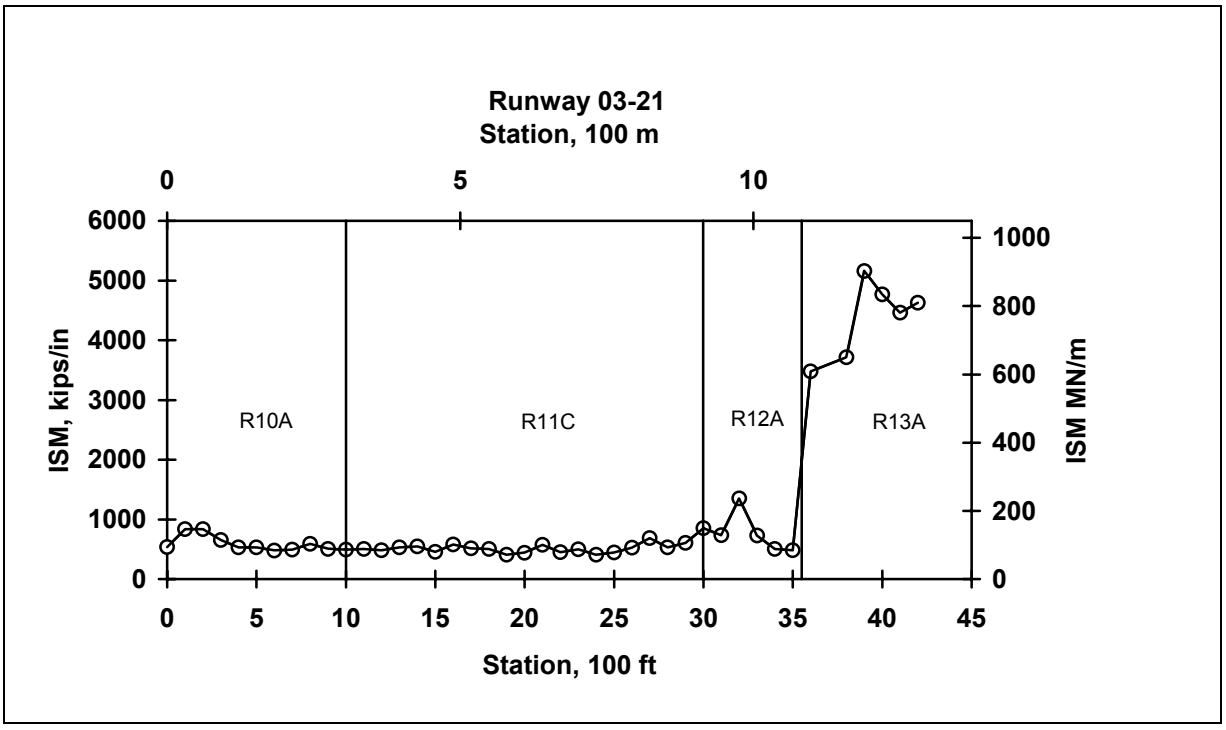

Figure B4. ISM profile, Runway 03-21, Features R10A thru R13A

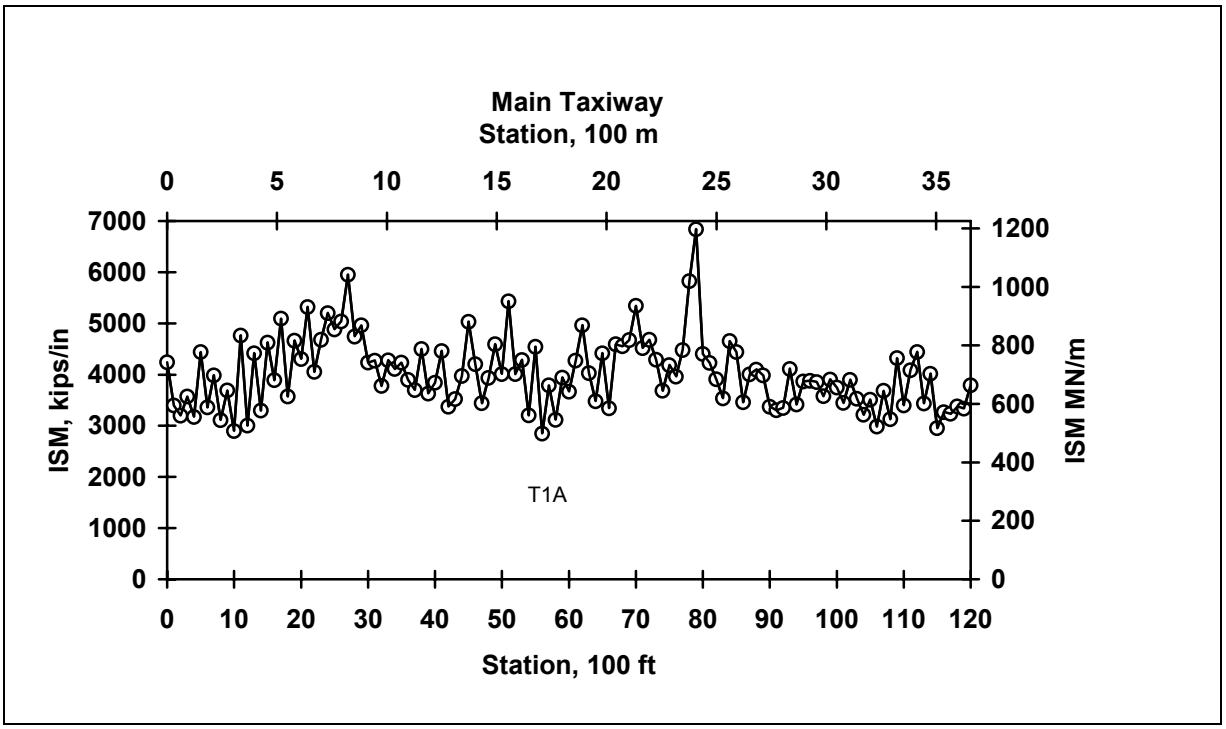

Figure B5. ISM profile, Main Taxiway, Feature T1A

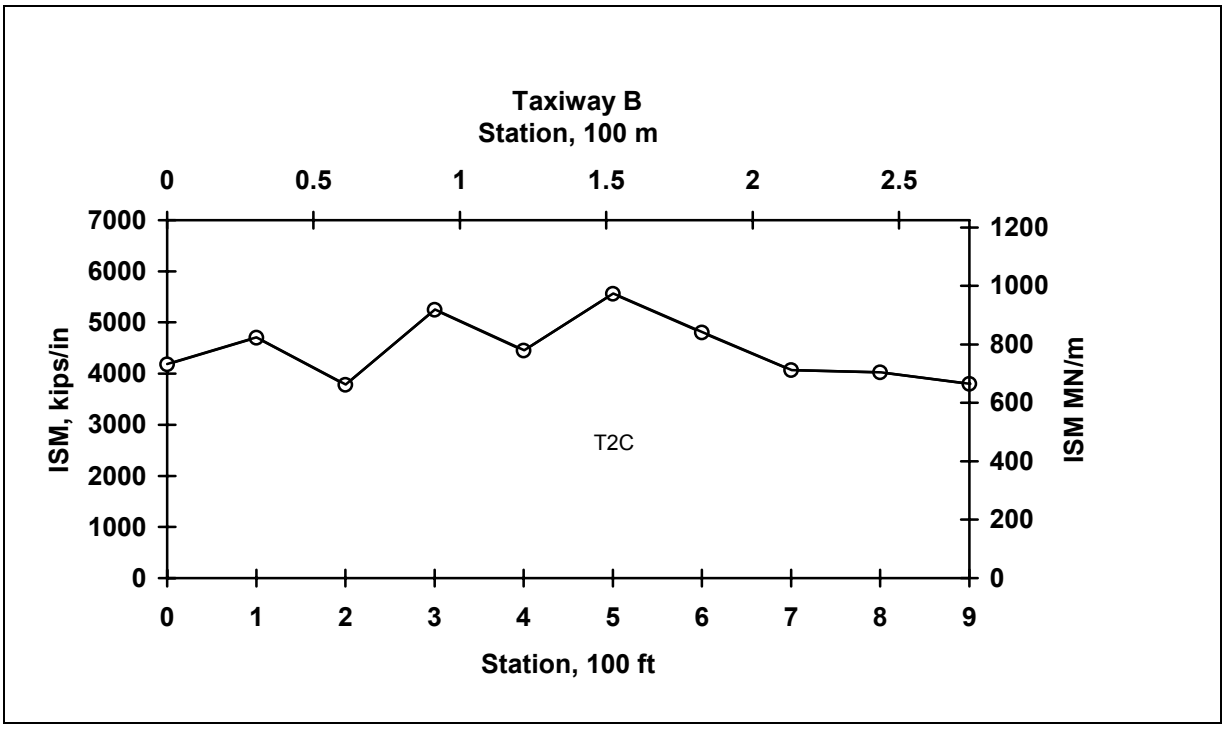

Figure B6. ISM profile, Taxiway B, Feature T2C

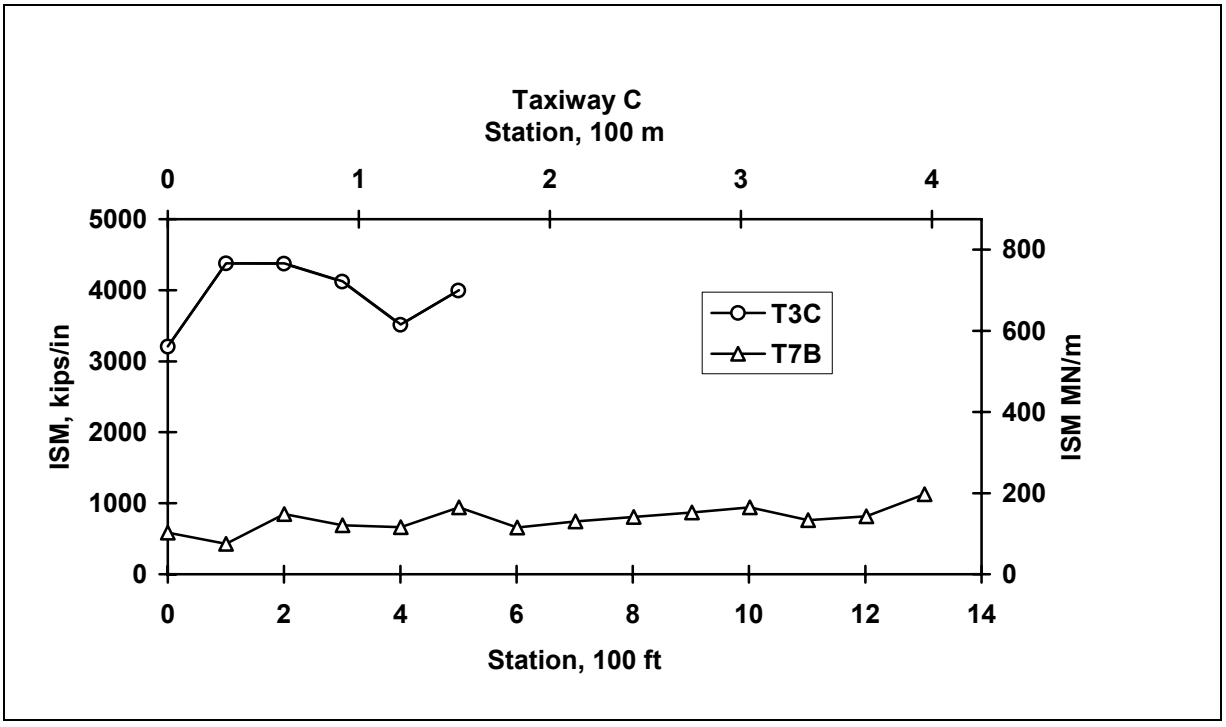

Figure B7. ISM profile, Taxiways C 01 and C 02, Features T3C and T7B

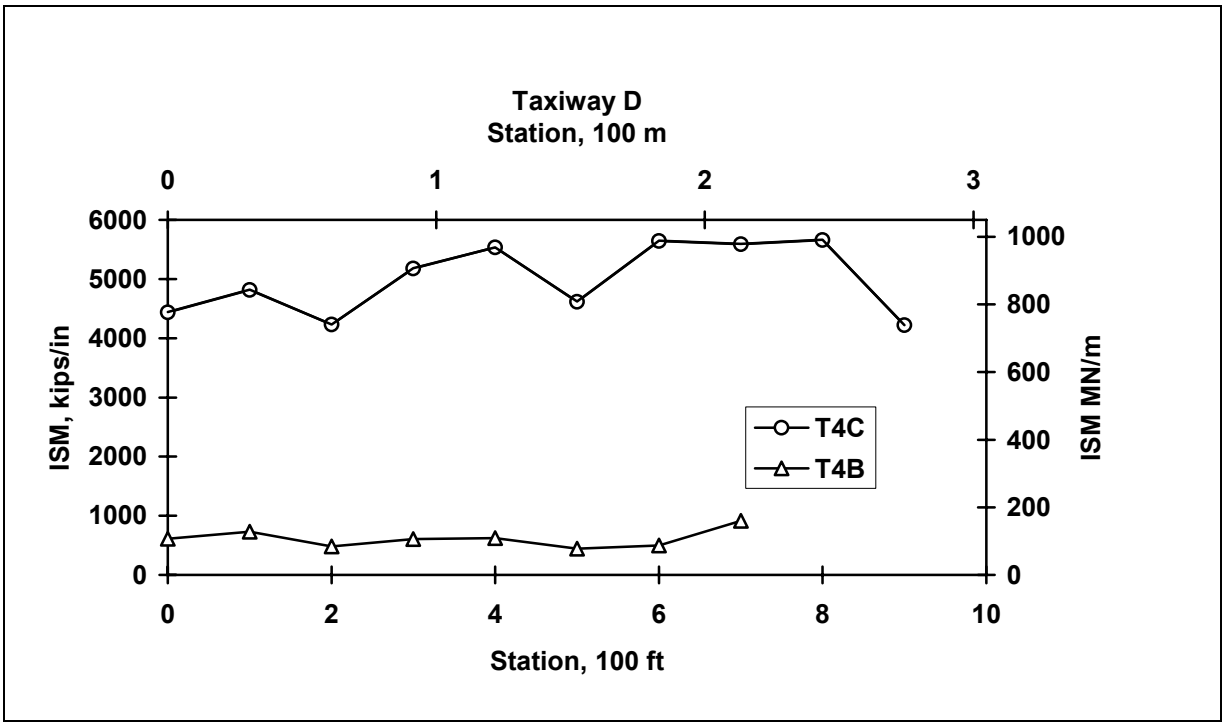

Figure B8. ISM profile, Taxiways D 01 and D 02, Features T4C and T4B

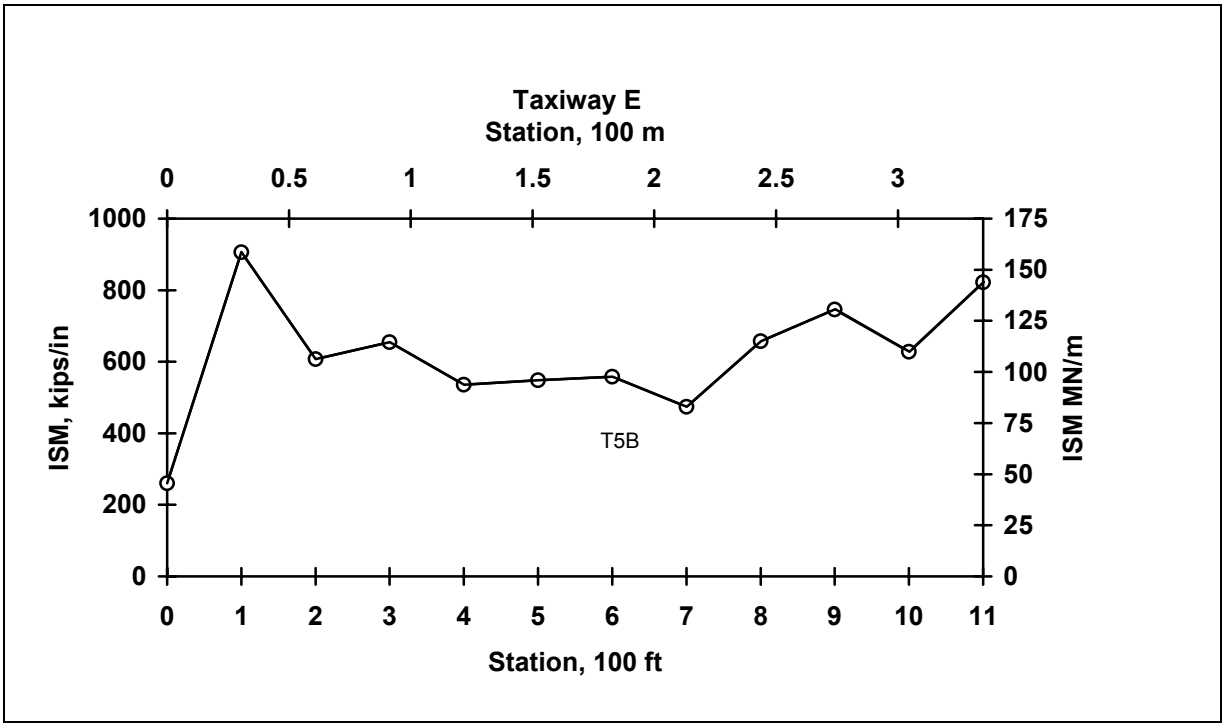

Figure B9. ISM profile, Taxiway E, Feature T5B

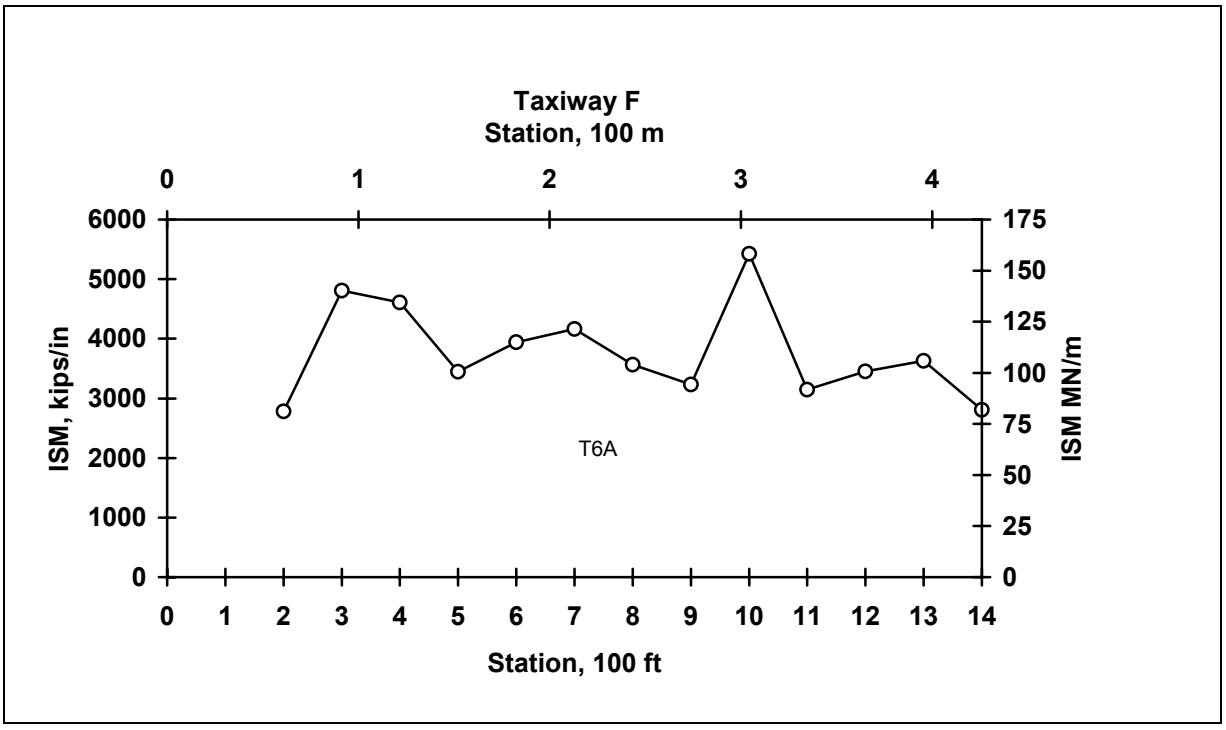

Figure B10. ISM profile, Taxiway F, Feature T6A

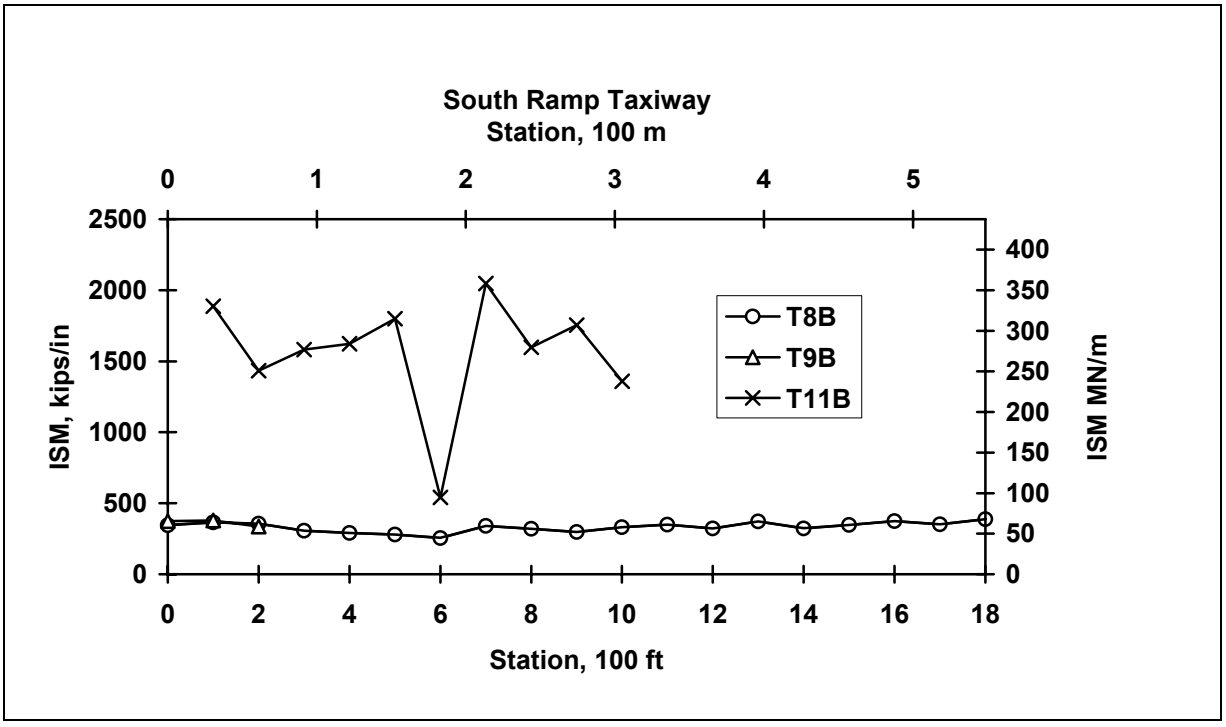

Figure B11. ISM profile, South Ramp Taxiway, Features T8B, T9B and T11B

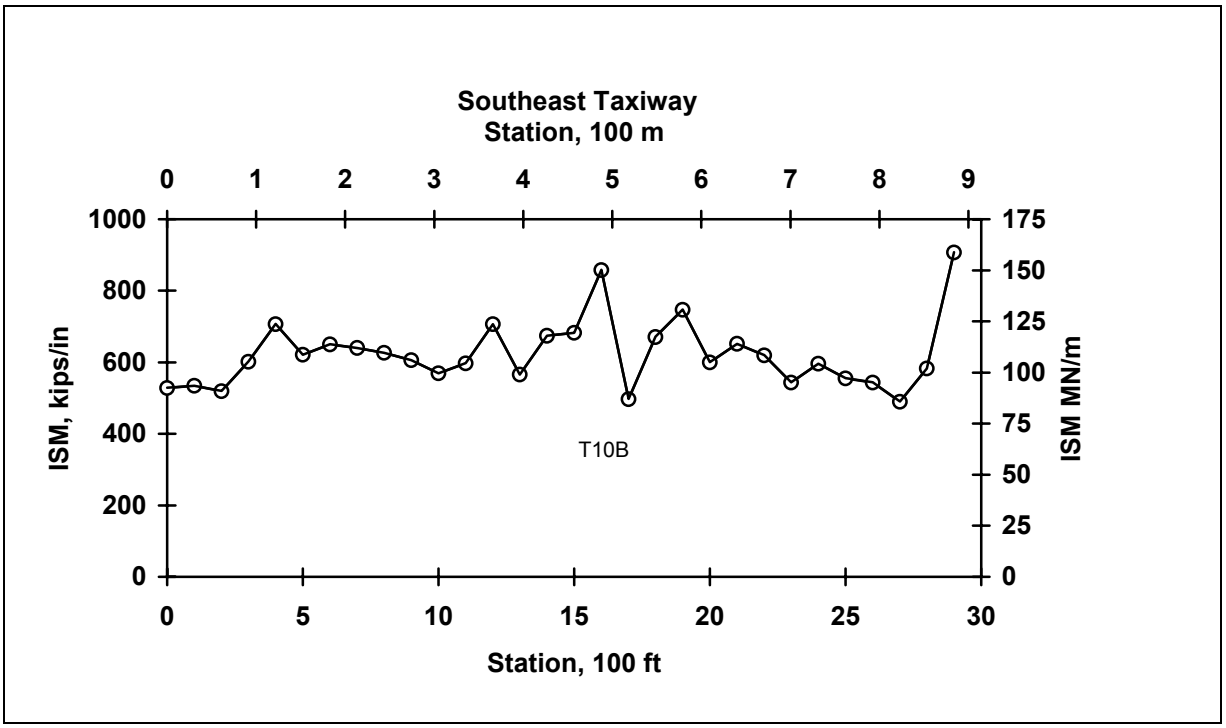

Figure B12. ISM profile, Southeast Taxiway, Feature T10B

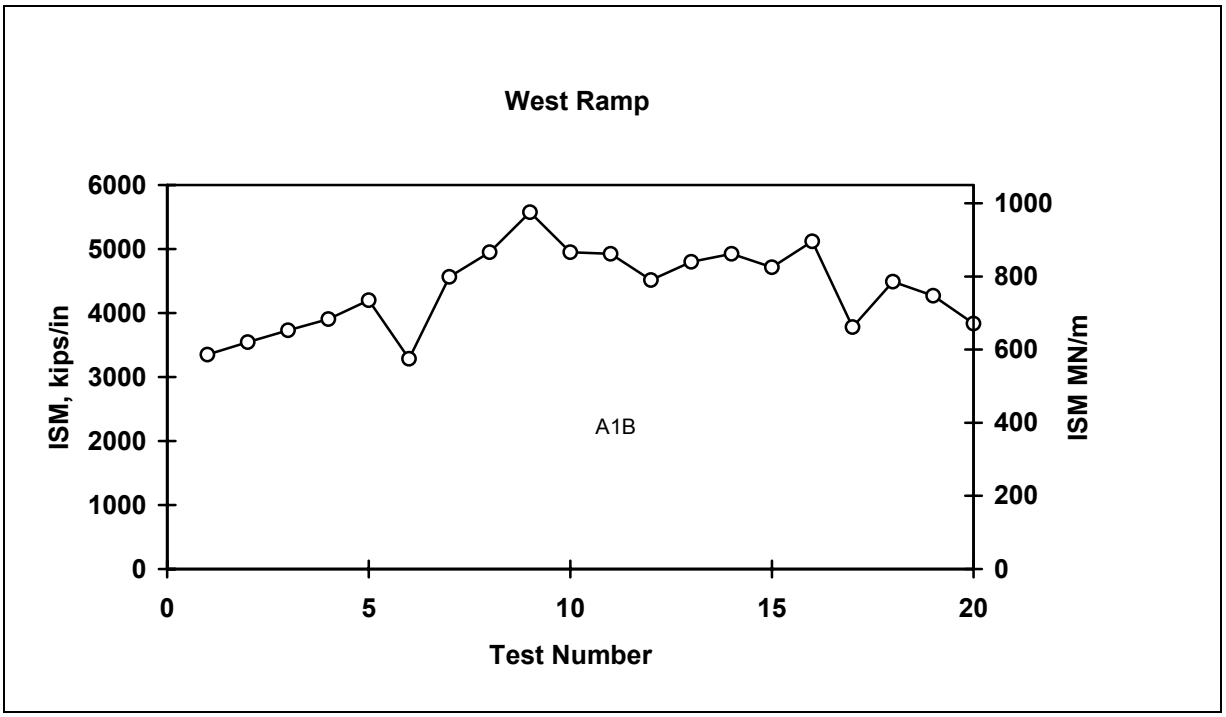

Figure B13. ISM profile, West Ramp, Feature A1B

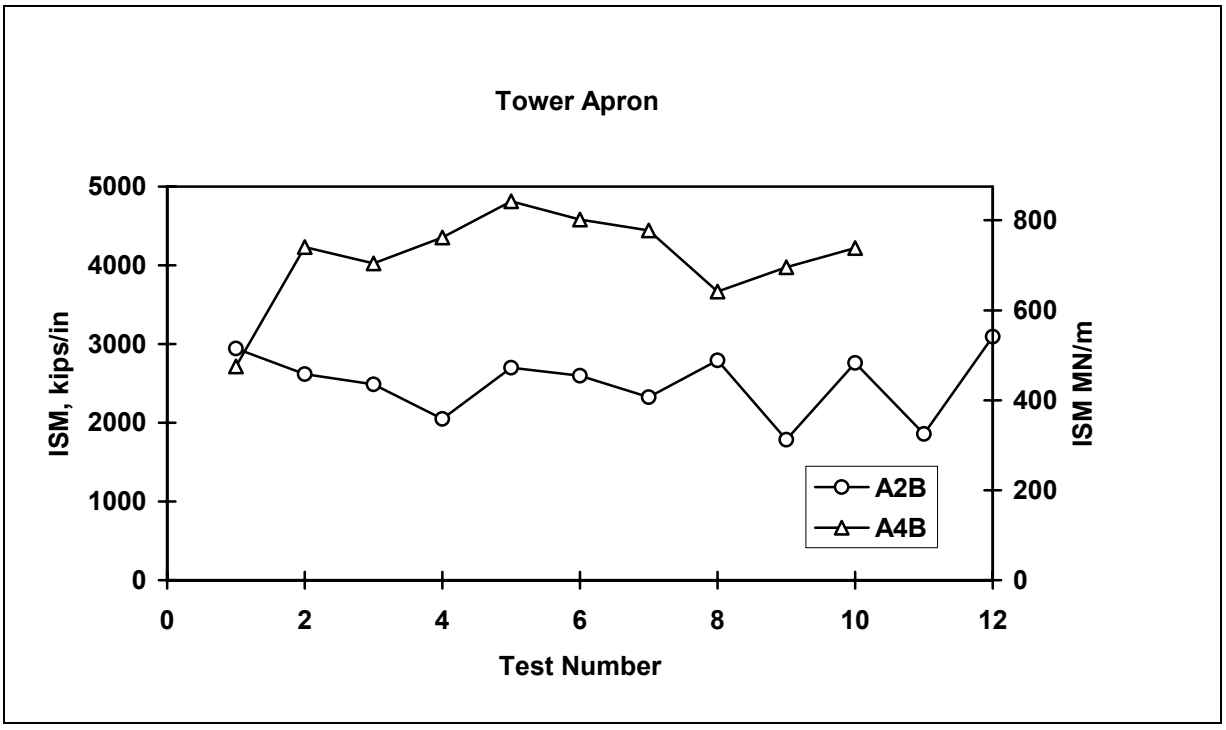

Figure B14. ISM profile, Tower Apron, Features A2B and A4B

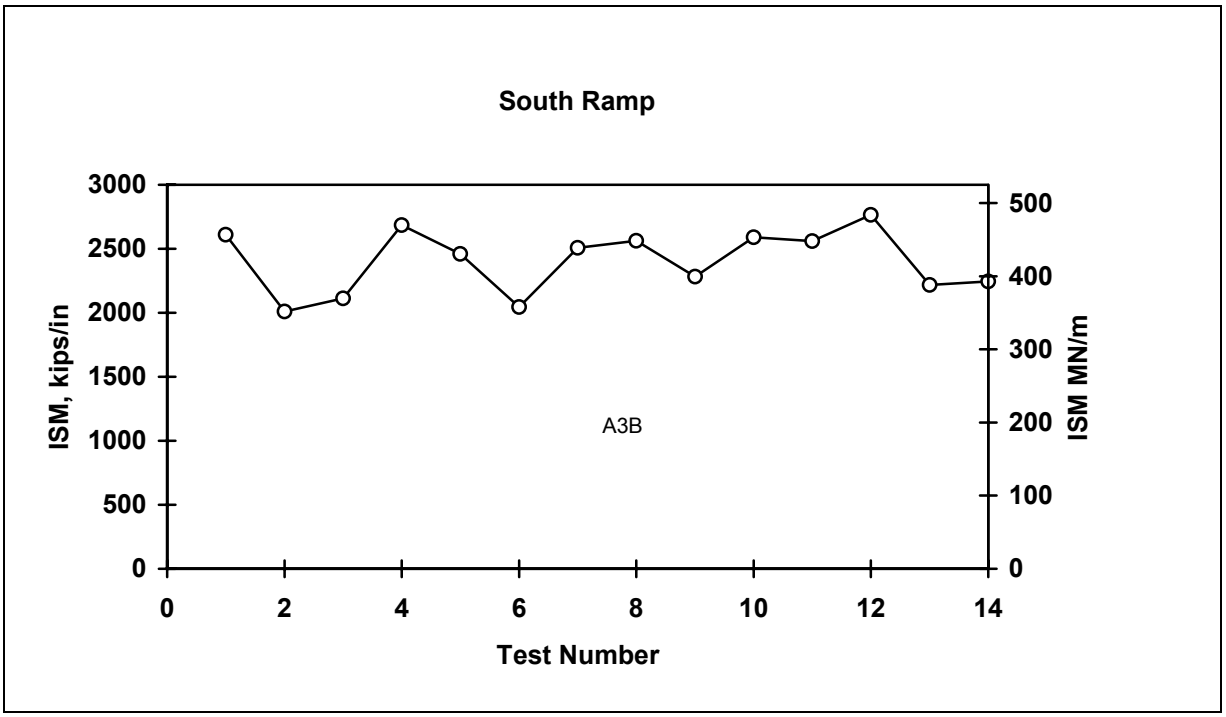

Figure B15. ISM profile, South Ramp, Feature A3B

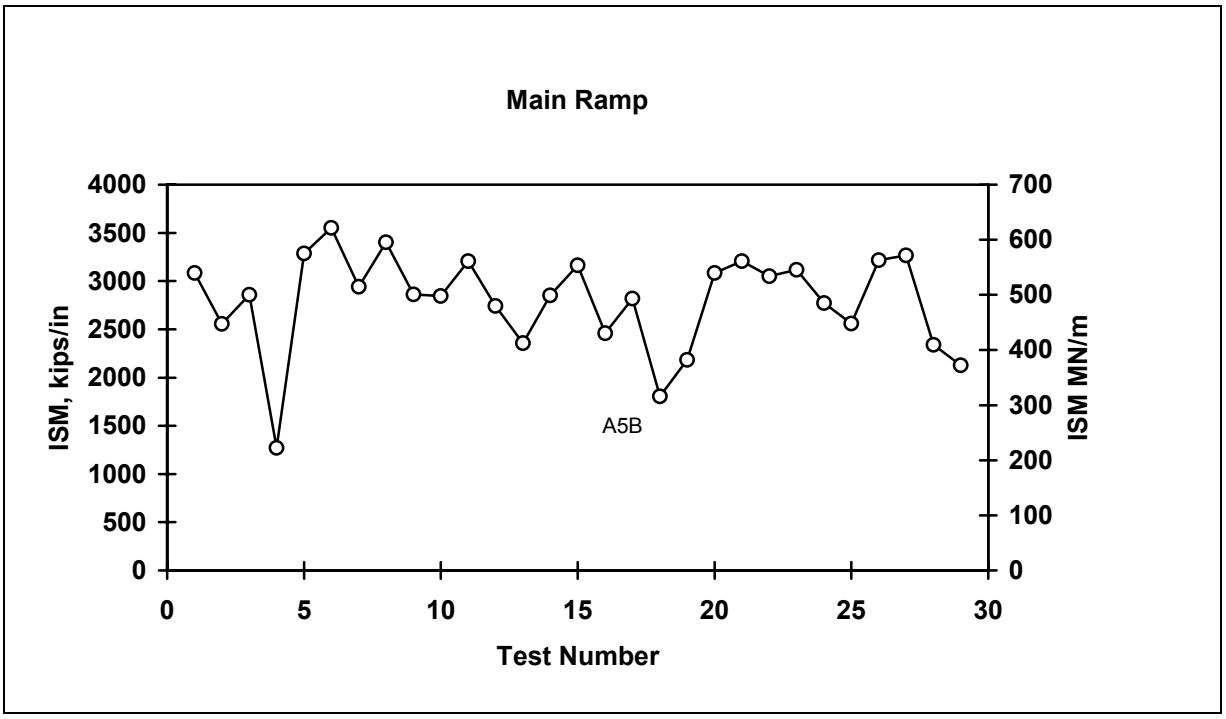

Figure B16. ISM profile, Main Ramp, Feature A5B

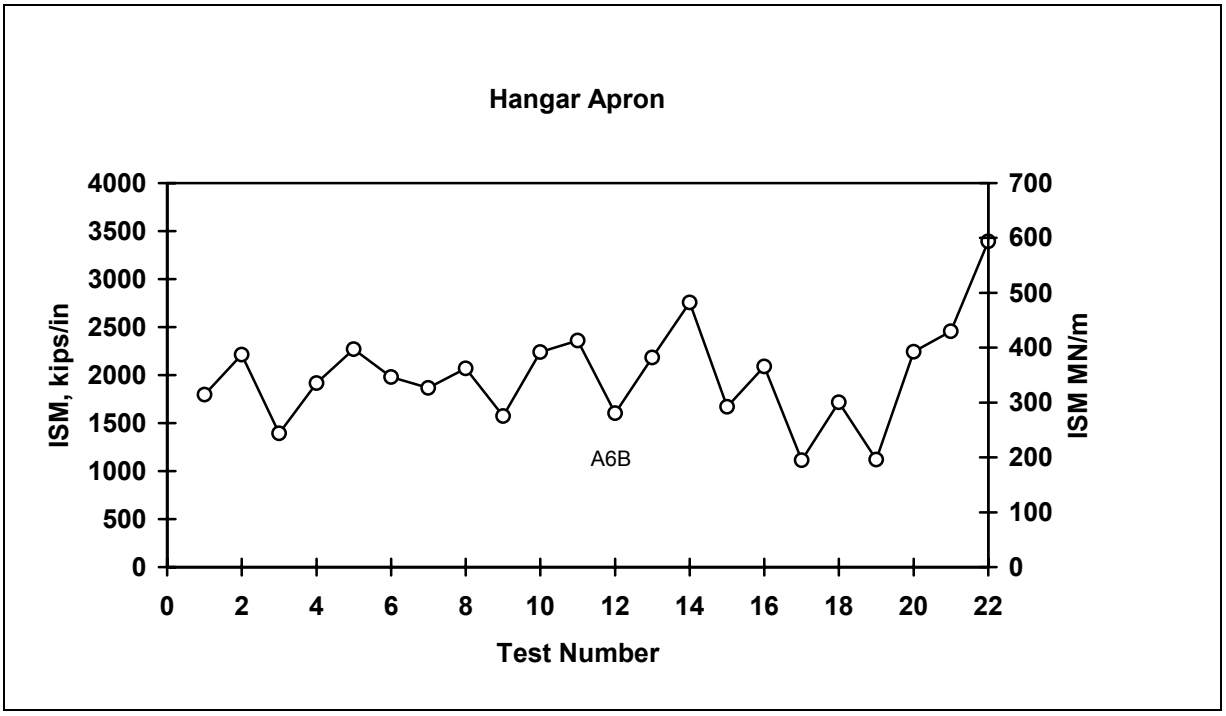

Figure B17. ISM profile, Hangar Apron, Feature A6B

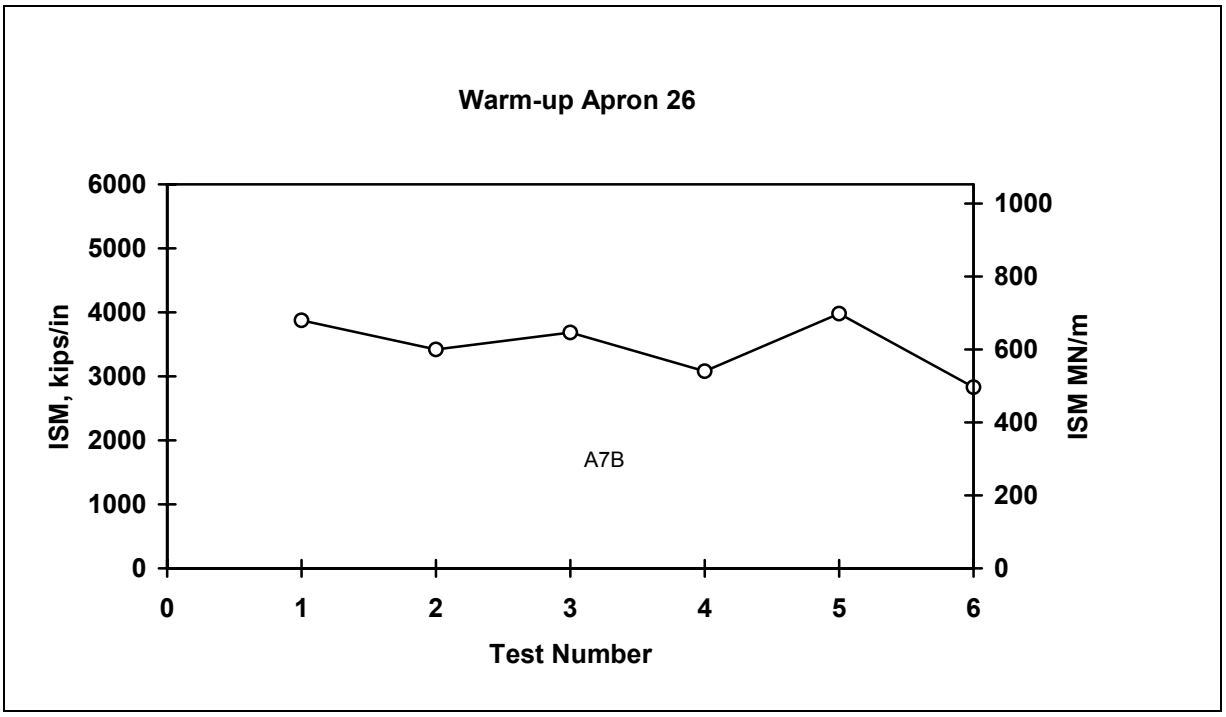

Figure B18. ISM profile, Warm-up Apron 26, Feature A7B

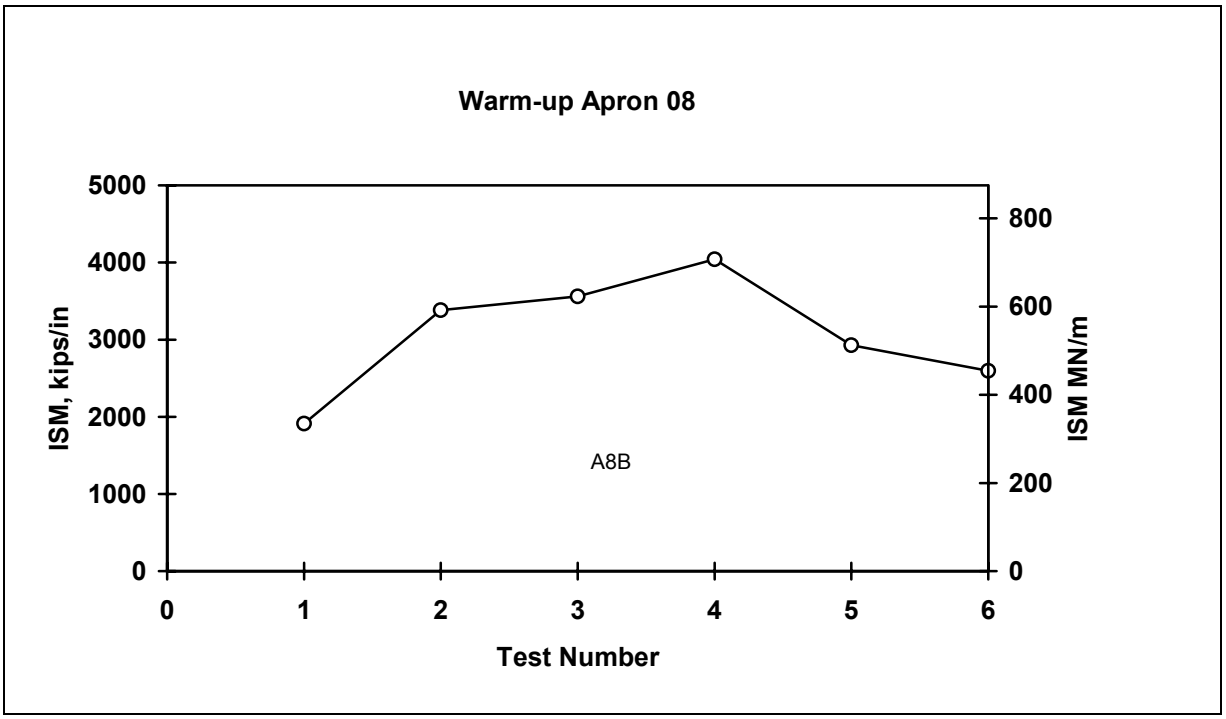

Figure B19. ISM profile, Warm-up Apron 08, Feature A8B

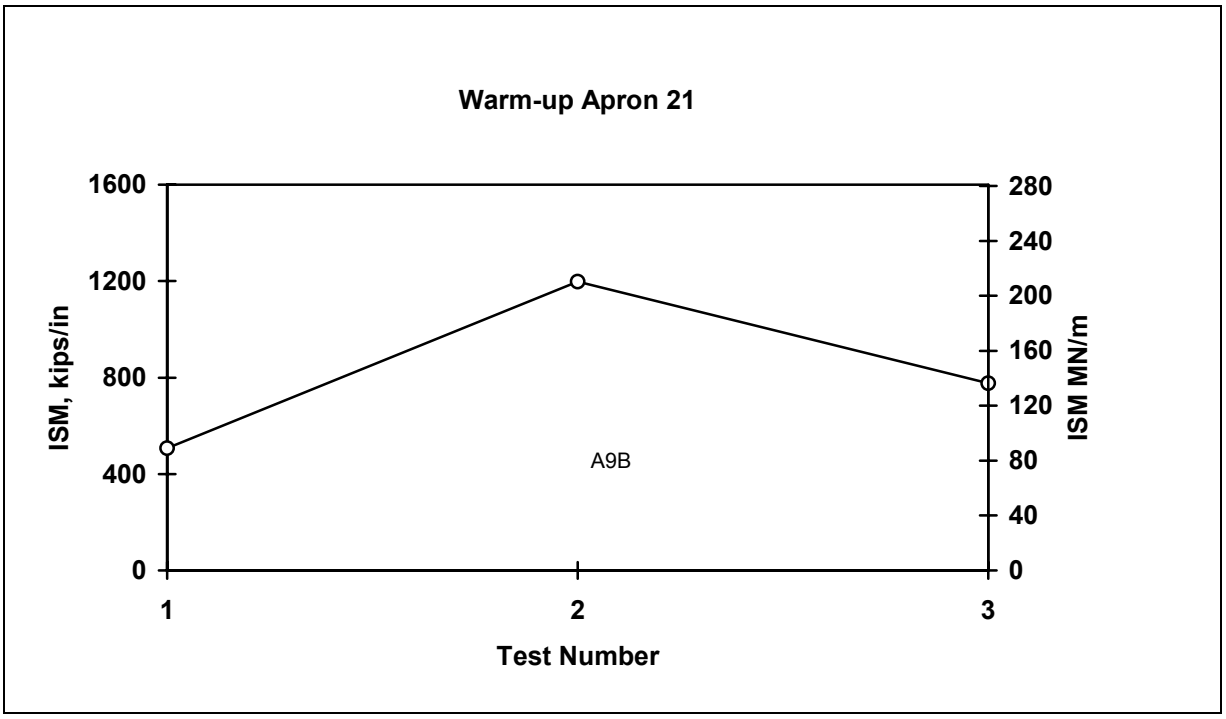

Figure B20. ISM profile, Warm-up Apron 21, Feature A9B

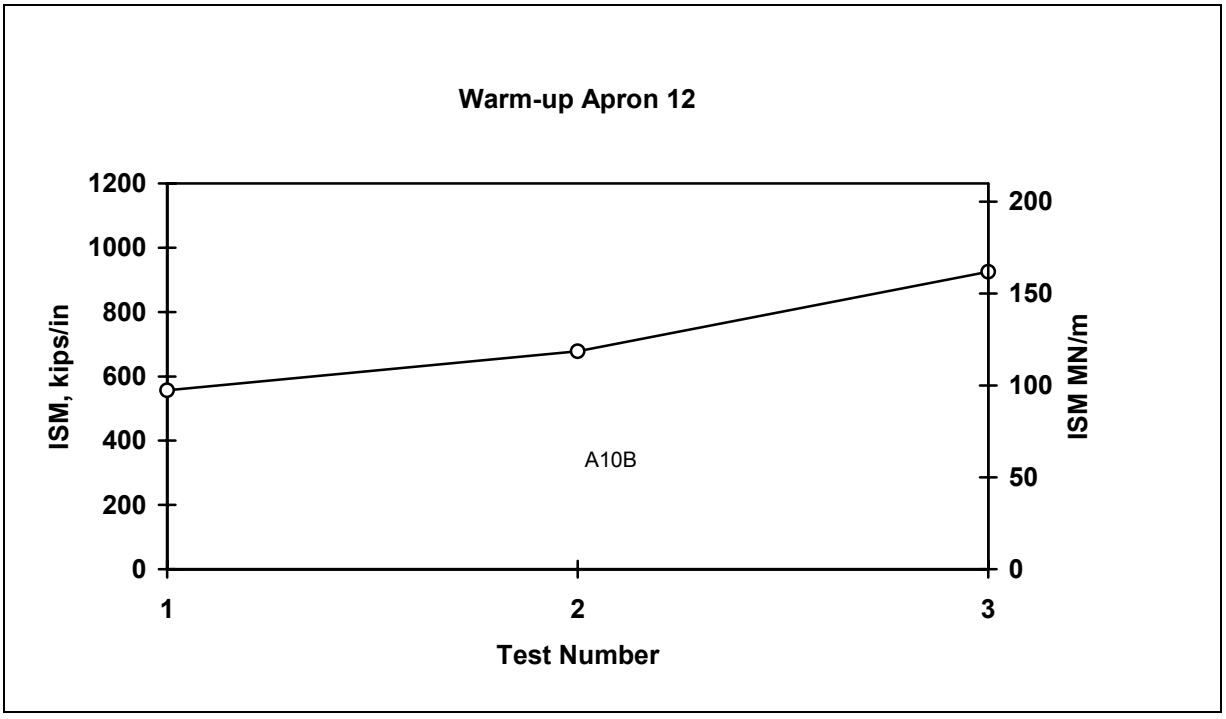

Figure B21. ISM profile, Warm-up Apron 12, Feature A10B

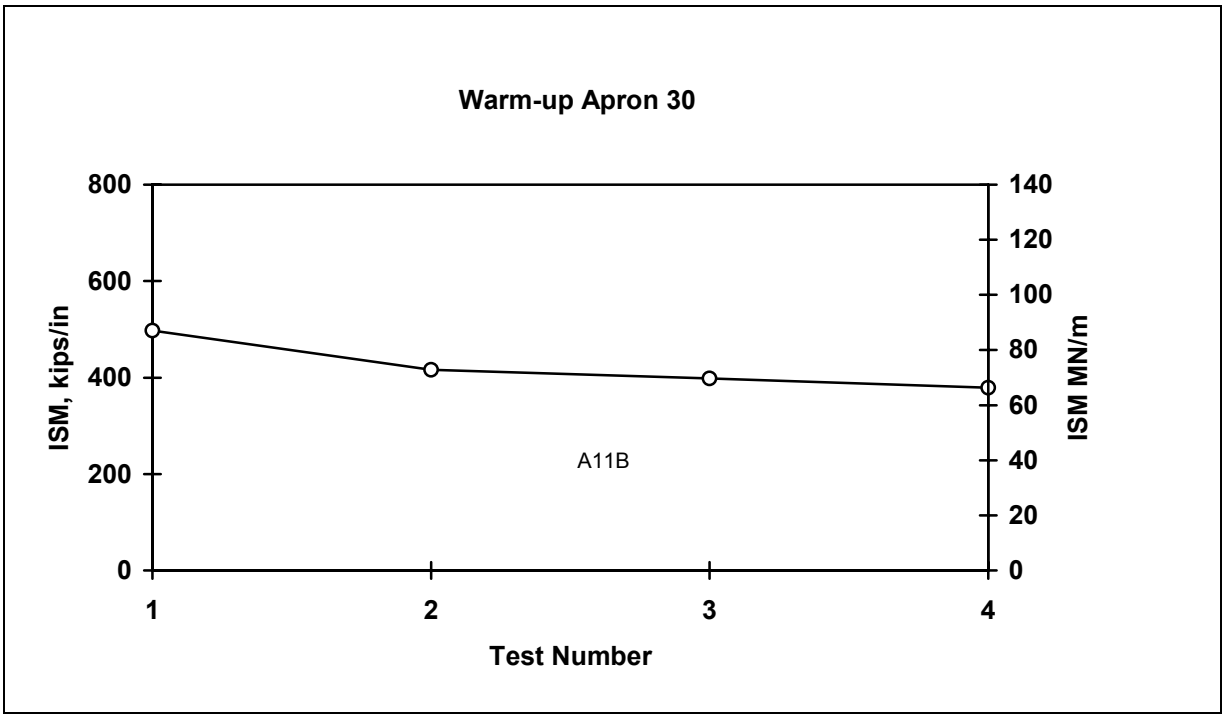

Figure B22. ISM profile, Warm-up Apron 30, Feature A11B

Table B1
NDT Test Results, Representative Basins

Feature	ISM MN/m (kips/in.)	Load kN (lb)	Deflection, µm (mils) D1	D2	D3	D4	D5	D6	D7
Runway 08-26									
R1A	617 (3,527)	238 (53,049)	381 (15.0)	338 (13.3)	300 (11.8)	259 (10.2)	218 (8.6)	183 (7.2)	147 (5.8)
R2C	560 (3,197)	236 (52,628)	419 (16.5)	368 (14.5)	323 (12.7)	272 (10.7)	229 (9.0)	183 (7.2)	145 (5.7)
R3C	721 (4,118)	226 (50,483)	312 (12.3)	267 (10.5)	224 (8.8)	183 (7.2)	150 (5.9)	117 (4.6)	89 (3.5)
R4C	420 (2,398)	225 (50,090)	531 (20.9)	503 (19.8)	462 (18.2)	419 (16.5)	368 (14.5)	315 (12.4)	261 (10.3)
R5A	715 (4,087)	224 (49,943)	310 (12.2)	310 (11.3)	259 (10.2)	229 (9.0)	196 (7.7)	163 (6.4)	135 (5.3)
Runway 12-30									
R6A	85 (483)	68 (15,219)	800 (31.5)	366 (14.4)	124 (4.9)	58 (2.3)	41 (1.6)	33 (1.3)	25 (1.0)
R7C	107 (614)	79 (17,515)	724 (28.5)	442 (17.4)	196 (7.7)	86 (3.4)	48 (1.9)	36 (1.4)	28 (1.1)
R8C	135 (772)	72 (15,966)	526 (20.7)	338 (13.3)	157 (6.2)	69 (2.7)	38 (1.5)	25 (1.0)	20 (0.8)
R9A	134 (765)	70 (15,533)	516 (20.3)	335 (13.2)	168 (6.6)	84 (3.3)	46 (1.8)	30 (1.2)	23 (0.9)
Runway 03-21									
R10A	115 (654)	92 (20,578)	800 (31.5)	526 (20.7)	272 (10.7)	137 (5.4)	74 (2.9)	46 (1.8)	36 (1.4)
R11C	96 (549)	96 (21,448)	993 (39.1)	554 (21.8)	241 (9.5)	97 (3.8)	58 (2.3)	46 (1.8)	41 (1.6)
R12A	128 (730)	99 (22,155)	772 (30.4)	495 (19.5)	259 (10.2)	137 (5.4)	81 (3.2)	56 (2.2)	41 (1.6)
R13A	781 (4,459)	225 (50,165)	287 (11.3)	259 (10.2)	226 (8.9)	191 (7.5)	157 (6.2)	124 (4.9)	99 (3.9)
Main Taxiway									
T1A	719 (4,108)	228 (50,769)	315 (12.4)	279 (11.0)	244 (9.6)	206 (8.1)	170 (6.7)	140 (5.5)	114 (4.5)
Taxiway B									
T2C	841 (4,802)	222 (49,561)	262 (10.3)	226 (8.9)	193 (7.6)	160 (6.3)	127 (5.0)	102 (4.0)	79 (3.1)
Taxiway C 01 & C 02									
T3C	767 (4,377)	221 (49,371)	287 (11.3)	257 (10.1)	221 (8.7)	191 (7.5)	155 (6.1)	124 (4.9)	97 (3.8)
T7B	133 (761)	96 (21,491)	716 (28.2)	472 (18.6)	246 (9.7)	114 (4.5)	61 (2.4)	41 (1.6)	30 (1.2)
Taxiway D 01 @ D 02									
T4C	907 (5,179)	225 (50,181)	246 (9.7)	211 (8.3)	173 (6.8)	137 (5.4)	107 (4.2)	79 (3.1)	58 (2.3)
T4B	107 (611)	97 (21,638)	899 (35.4)	579 (22.8)	292 (11.5)	140 (5.5)	69 (2.7)	41 (1.6)	30 (1.2)
Taxiway E									
T5B	144 (822)	94 (20,884)	645 (25.4)	381 (15.0)	170 (6.7)	81 (3.2)	48 (1.9)	38 (1.5)	30 (1.2)

(Continued)

Table B1 (Concluded)

Feature	ISM MN/m (kips/in.)	Load kN (lb)	Deflection, μm (mils) D1	D2	D3	D4	D5	D6	D7
Taxiway F									
T6A	636 (3,634)	226 (50,360)	353 (13.9)	318 (12.5)	282 (11.1)	246 (9.7)	208 (8.2)	173 (6.8)	140 (5.5)
South Ramp Taxiway									
T8B	58 (331)	73 (16,303)	1 250 (49.2)	660 (26.0)	279 (11.0)	132 (5.2)	74 (2.9)	43 (1.7)	28 (1.1)
T9B	66 (380)	72 (16,029)	1 074 (42.3)	544 (21.4)	183 (7.2)	86 (3.4)	48 (1.9)	38 (1.5)	28 (1.1)
T11B	280 (1,596)	218 (48,675)	775 (30.5)	732 (28.8)	610 (24.0)	480 (18.9)	361 (14.2)	267 (10.5)	191 (7.5)
Southeast Taxiway									
T10B	112 (640)	92 (20,602)	818 (32.2)	460 (18.1)	221 (8.7)	119 (4.7)	66 (2.6)	56 (2.2)	38 (1.5)
West Ramp									
A1B	736 (4,201)	236 (52,735)	320 (12.6)	262 (10.3)	211 (8.3)	165 (6.5)	130 (5.1)	102 (4.0)	81 (3.2)
Tower Apron									
A2B	484 (2,761)	231 (51,468)	472 (18.6)	381 (15.0)	279 (11.0)	196 (7.7)	135 (5.3)	91 (3.6)	59 (2.3)
A4B	704 (4,020)	243 (54,269)	343 (13.5)	290 (11.4)	231 (9.1)	178 (7.0)	130 (5.1)	91 (3.6)	58 (2.3)
South Ramp									
A3B	431 (2,461)	239 (53,431)	551 (21.7)	457 (18.0)	345 (13.6)	254 (10.0)	183 (7.2)	127 (5.0)	86 (3.4)
Main Ramp									
A5B	500 (2,858)	225 (50,098)	445 (17.5)	386 (15.2)	315 (12.4)	249 (9.8)	188 (7.4)	135 (5.3)	97 (3.8)
Hangar Apron									
A6B	347 (1,981)	223 (49,665)	638 (25.1)	564 (22.2)	462 (18.2)	358 (14.1)	267 (10.5)	186 (7.3)	127 (5.0)
Warm-up Apron 26									
A7B	645 (3,684)	222 (49,482)	340 (13.4)	323 (12.7)	290 (11.4)	259 (10.2)	224 (8.8)	191 (7.5)	155 (6.1)
Warm-up Apron 08									
A8B	513 (2,930)	230 (510270)	445 (17.5)	371 (14.6)	330 (13.0)	292 (11.5)	249 (9.8)	208 (8.2)	168 (6.6)
Warm-up Apron 21									
A9B	136 (777)	94 (20,919)	683 (26.9)	475 (18.7)	254 (10.0)	145 (5.7)	84 (3.3)	56 (2.2)	41 (1.6)
Warm-up Apron 12									
A10B	162 (925)	97 (21,575)	592 (23.3)	340 (13.4)	140 (5.5)	69 (2.7)	38 (1.5)	28 (1.1)	23 (0.9)
Warm-up Apron 30									
A11B	66 (379)	90 (19,978)	1 339 (52.7)	630 (24.8)	254 (10.0)	119 (4.7)	74 (2.9)	48 (1.9)	38 (1.5)

Table B2
Summary of Modulus Values[1]

Feature	Surface Modulus MPa (psi[1])	Base Modulus MPa (psi[1])	Subbase Modulus MPa (psi[1])	Subgrade Modulus MPa (psi[1])
PCC Pavements				
R1A	37 181 (5,392,681)	170 (24,594)[2]	--	170 (24,594)[2]
R2C	26 932 (3,906,198)	183 (26,543)[2]	--	183 (26,543)[2]
R3C	42 688 (6,191,364)	259 (37,577)[3]	259 (37,577)[3]	259 (37,577)[3]
R4C	37 978 (5,508,403)	79 (11,431)[2]	--	79 (11,431)[2]
R5A	50 563 (7,333,565)	168 (24,327)[2]	--	168 (24,327)[2]
R13A	52 754 (7,651,418)	245 (35,508)[3]	245 (35,508)[3]	245 (35,508)[3]
T1A	37 341 (5,415,851)	218 (31,563)[2]	--	218 (31,563)[2]
T2C	48 241 (6,996,883)	308 (44,708)[3]	308 (44,708)[3]	308 (44,708)[3]
T3C	51 541 (7,475,454)	245 (35,517)[3]	245 (35,517)[3]	245 (35,517)[3]
T4C	40 121 (5,819,014)	392 (56,845)[3]	392 (56,845)[3]	392 (56,845)[3]
T6A	43 843 (6,358,919)	168 (24,433)[2]	--	168 (24,433)[2]
T11B	27 478 (3,985,379)	114 (16,589)[2]	--	114 (16,589)[2]
A1B	31 583 (4,580,827)	329 (47,787)[2]	--	329 (47,787)[2]
A2B	22 775 (3,303,302)	297 (43,034)[2]	--	297 (43,034)[2]
A3B	26 270 (3,810,221)	257 (37,307)[2]	--	257 (37,307)[2]
A4B	50 639 (7,344,644)	379 (54,901)[2]	--	379 (54,901)[2]
A5B	24 499 (3,553,282)	231 (33,546)[2]	--	231 (33,546)[2]
A6B	28 353 (4,112,350)	165 (23,993)[2]	--	165 (23,993)[2]
A7B	47 895 (6,946,695)	128 (18,603)[2]	--	128 (18,603)[2]
A8B	31 832 (4,616,919)	145 (20,966)[2]	--	145 (20,966)[2]

(Continued)

[1] Backcalculated modulus values using WESDEF.
[2] Base and subgrade were combined.
[3] Base, subbase and subgrade were combined.
[4] AC modulus based on temperature at the time of testing.
[5] Subbase and subgrade were combined.

Table B2 (Concluded)

Feature	Surface Modulus MPa (psi[1])	Base Modulus MPa (psi[1])	Subbase Modulus MPa (psi[1])	Subgrade Modulus MPa (psi[1])
AC Pavements [4]				
R6A	448 (64,936)	383 (55,491)	203 (29,478) [5]	203 (29,478) [5]
R7C	1644 (238,387)	399 (57,799)	182 (26,429) [5]	182 (26,429) [5]
R8C	2683 (389,078)	379 (54,946)	200 (29,015) [5]	200 (29,015) [5]
R9A	3545 (514,116)	349 (50,665)	204 (29,530) [5]	204 (29,530) [5]
R10A	2053 (297,790)	334 (48,527)	--	165 (23,883)
R11C	2037 (295,456)	299 (43,424)	--	139 (20,186)
R12A	4232 (613,840)	352 (51,096)	--	178 (25,870)
T4B	2166 (314,129)	349 (50,633)	--	176 (25,505)
T5B	4681 (678,940)	345 (50,075)	--	173 (25,070)
T7B	3566 (517,168)	397 (57,603)	--	216 (31,312)
T8B	6289 (912,167)	350 (50,720)	--	176 (25,573)
T9B	5595 (811,499)	332 (48,165)	--	163 (23,611)
T10B	1745 (403,216)	354 (51,297)	--	179 (26,029)
A9B	2780 (1,002,663)	278 (40,317)	--	162 (23,543)
A10B	3182 (461,554)	357 (51,805)	--	182 (26,433)
A11B	501 (72,730)	327 (47,413)	--	159 (23,049)

[1] Backcalculated modulus values using WESDEF.
[2] Base and subgrade were combined.
[3] Base, subbase and subgrade were combined.
[4] AC modulus based on temperature at the time of testing.
[5] Subbase and subgrade were combined.

Appendix C
Pavement Condition Survey and Results

Pavement Condition Survey

A pavement condition survey is a visual inspection of the airfield pavements to determine the present surface condition. The condition survey consists of inspecting the pavement surface for various types of distress, determining the severity of each distress, and measuring the quantity of each distress. The estimated quantities and severity of each distress type are used to compute the PCI for each feature. The PCI is a numerical indicator based on a scale from 0 to 100 and is determined by measuring pavement surface distress that reflects the surface condition of the pavement. Pavement condition ratings (from excellent to failed) are assigned to different levels of PCI values. These ratings and their respective PCI value definitions are shown in Figure C1. The distress types, severity levels, methods of survey, and PCI calculations are described in ASTM D5340-93.

The PCI and estimated distress quantities are determined for each feature. The information is based on inspection of a selected number of sample units. Sample units are subdivisions of a feature used exclusively to facilitate the inspection process and reduce the effort needed to determine distress quantities and the PCI. Each feature was divided into sample units. The sample units for AC pavement features were approximately 465 sq m (5,000 sq ft). A statistical sampling technique was used to determine the number of sample units to be inspected to provide a 95 percent confidence level. Sample units were chosen along the centerline of the taxiways and randomly on the runway and on the aprons. Sample unit locations for the various runway features are shown in Figures C2 through C7. Sample unit locations for the taxiway and apron features are shown in Figures C7 through C14. The surveyed sample units are circled. After the sample units were inspected, the mean PCI of all sample units within a feature was calculated and the feature was rated as to its condition: excellent, very good, good, fair, poor, very poor, or failed.

Analysis of PCI Data

The distress information collected during the survey was used with the Micro PAVER computer program to estimate the quantities of distress types for each feature. This information is presented along with the PCI, general rating, and distress mechanism (load, climate, or other) in Appendix E. Photos C1 through C10 show various types of distresses observed during the survey.

AR 420-72 (Headquarters, Department of the Army 2000) requires that all airfield pavements be maintained at or above the following PCI ranges:

All runways > 70
All primary taxiways ≥ 60
All aprons and secondary taxiways > 55

AR 420-72 (Headquarters, Department of the Army 2000) also requires that the following PCI range for airfield pavements shall be used for the Installation Status Report (ISR) rating:

$70 < PCI \leq 100$ equals an ISR Green rating
$55 < PCI \leq 70$ equals an ISR Amber rating
$0 < PCI \leq 55$ equals an ISR Red rating

The PCI for each sample unit inspected was calculated and stored on a Micro PAVER file for LAAF. The mean PCI for each feature was then calculated to determine the general condition or rating of the feature as shown in Figure C15. The PCI results are summarized in Table C1.

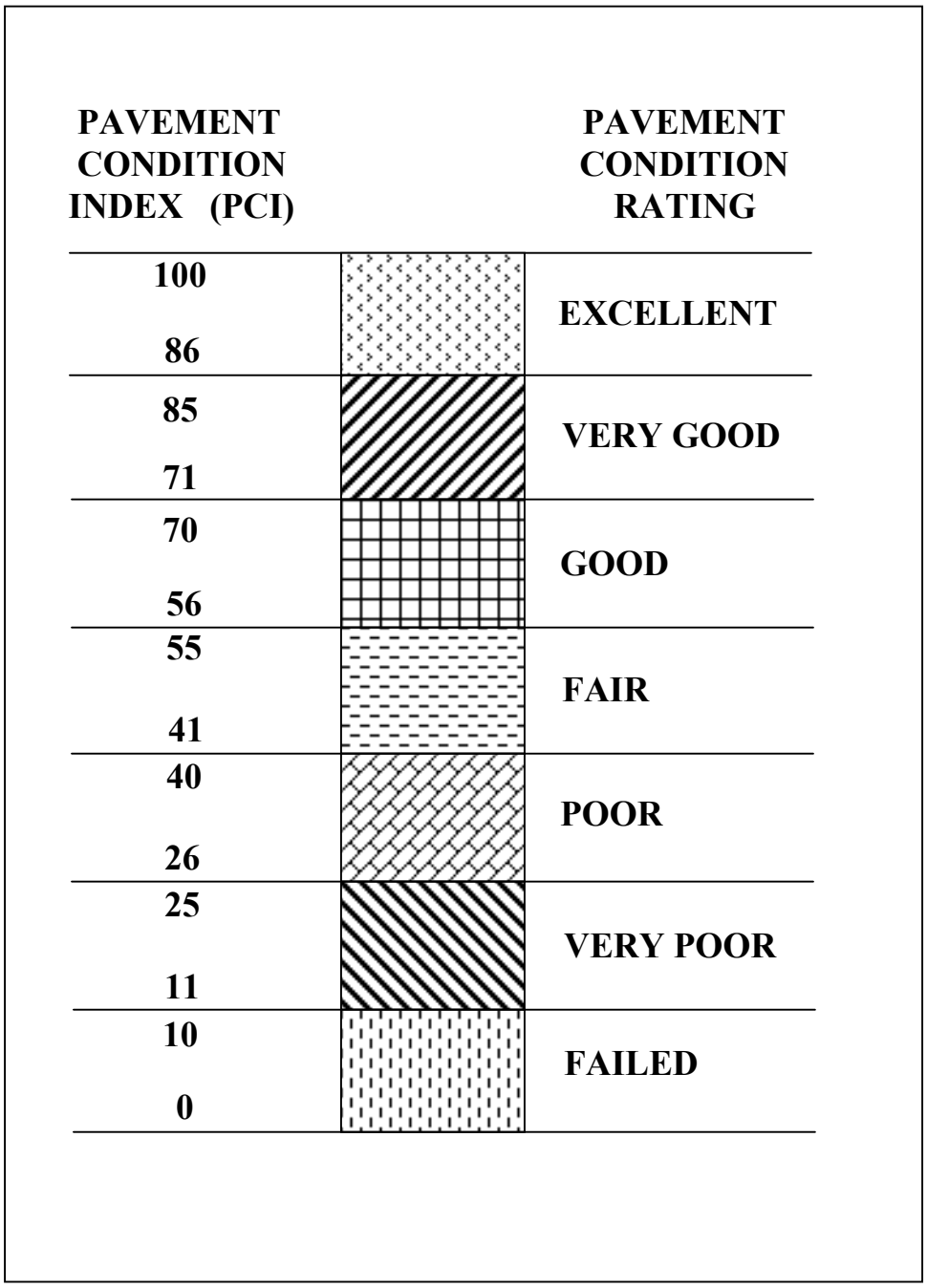

Figure C1. Scale for pavement condition rating

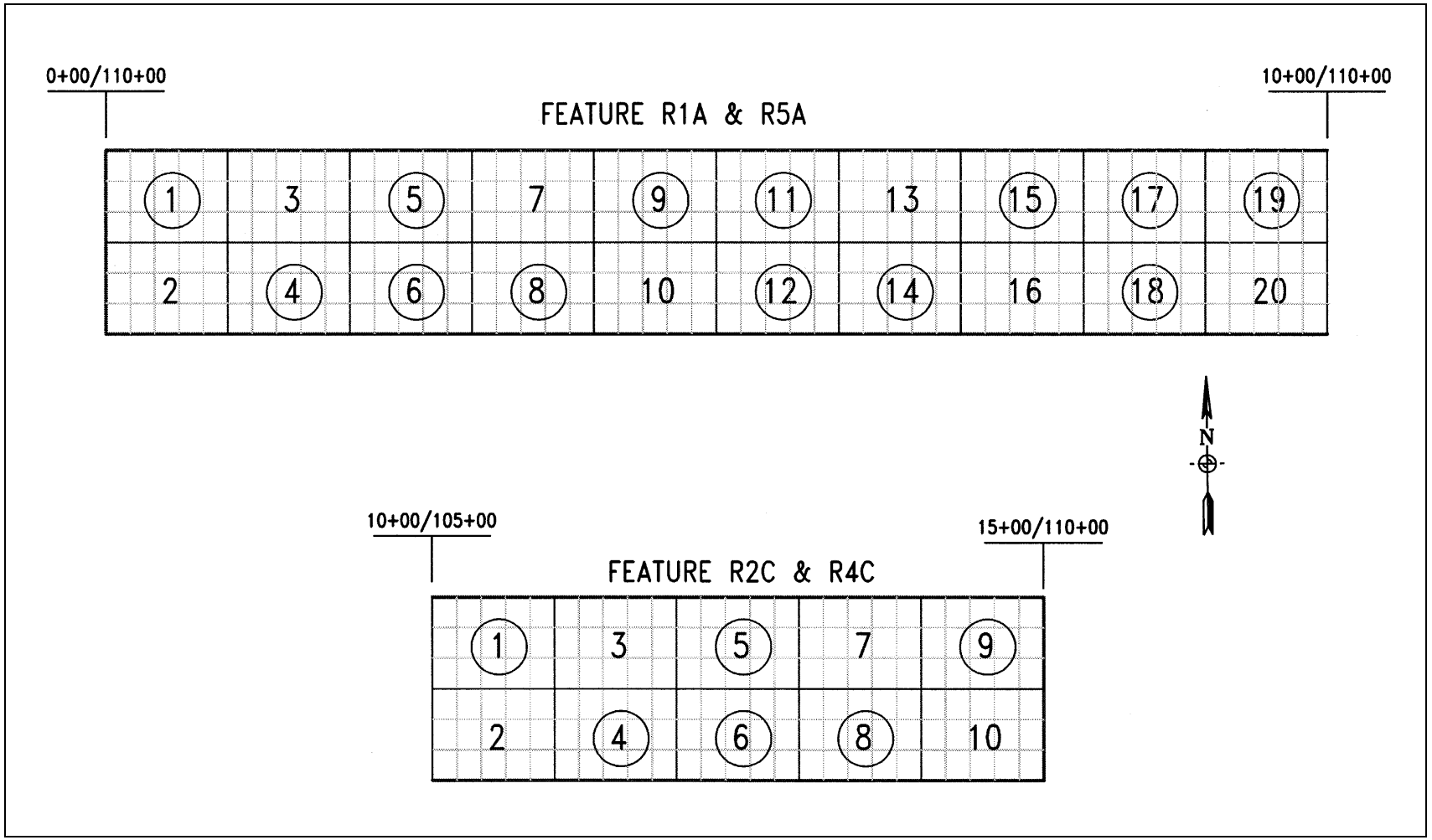

Figure C2. Sample unit layout, Runway 08-26, features R1A,R2C, R4C, and R5A

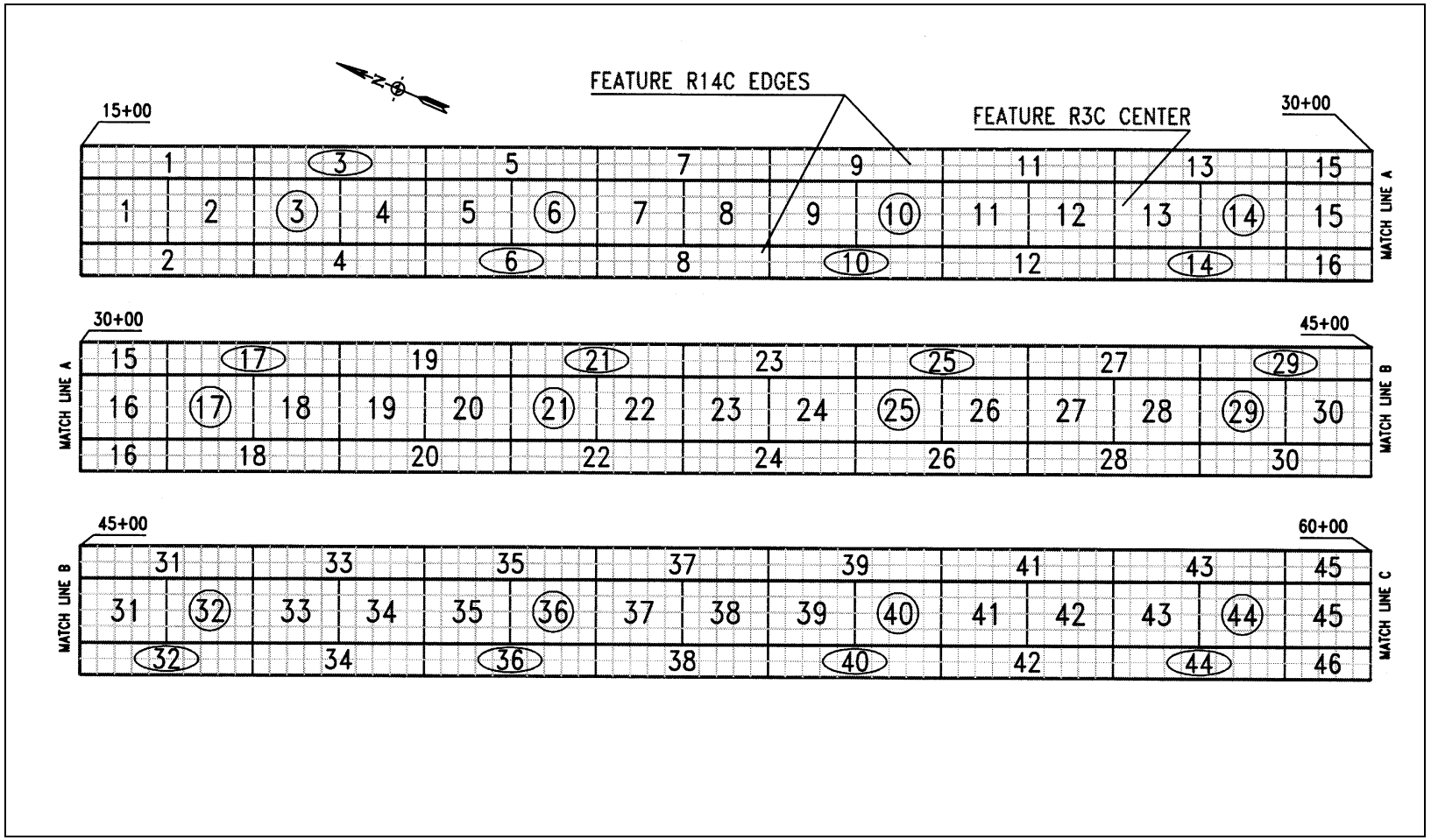

Figure C3. Sample unit layout, Runway 08-26, features R3C and R14C (Sta 15+00-60+00)

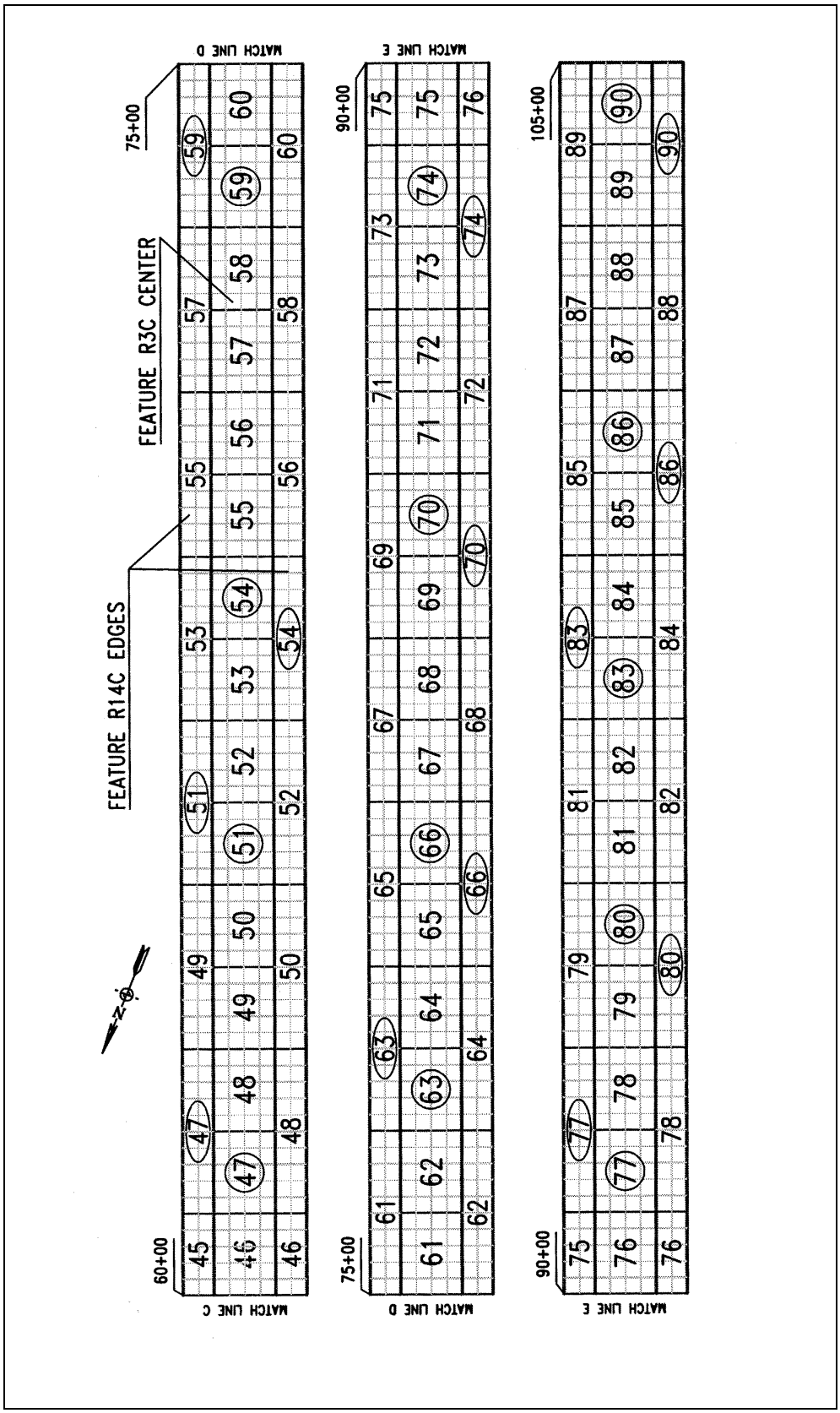

Figure C4. Sample unit layout, Runway 08-26, features R3C and R14C (Sta 60+00-105+00)

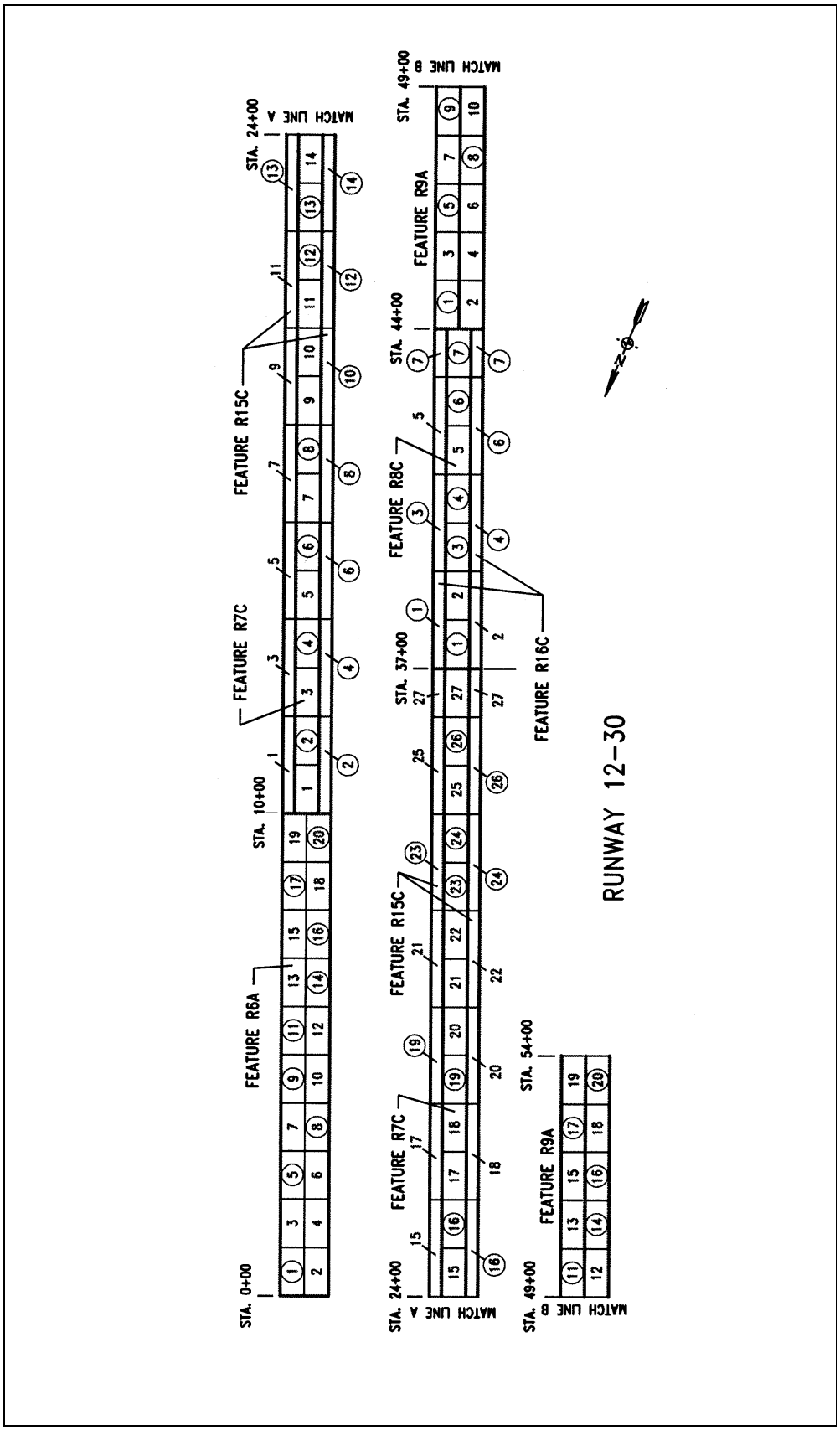

Figure C5. Sample unit layout, Runway 12-30, features R6A, R7C, R8C, R9A, R15C, and R16C

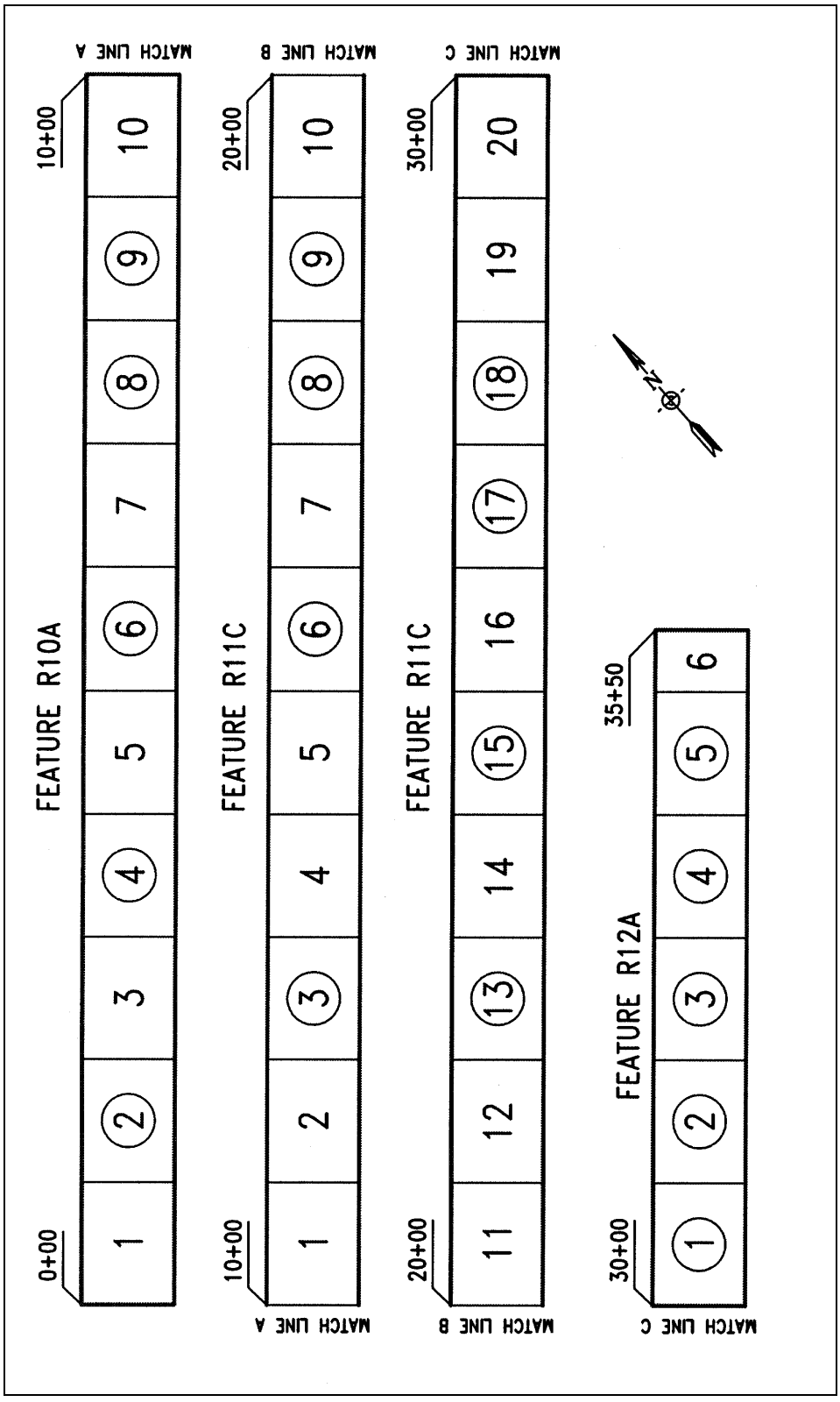

Figure C6. Sample unit layout, Runway 03-21, features R10A, R11C, and R12A

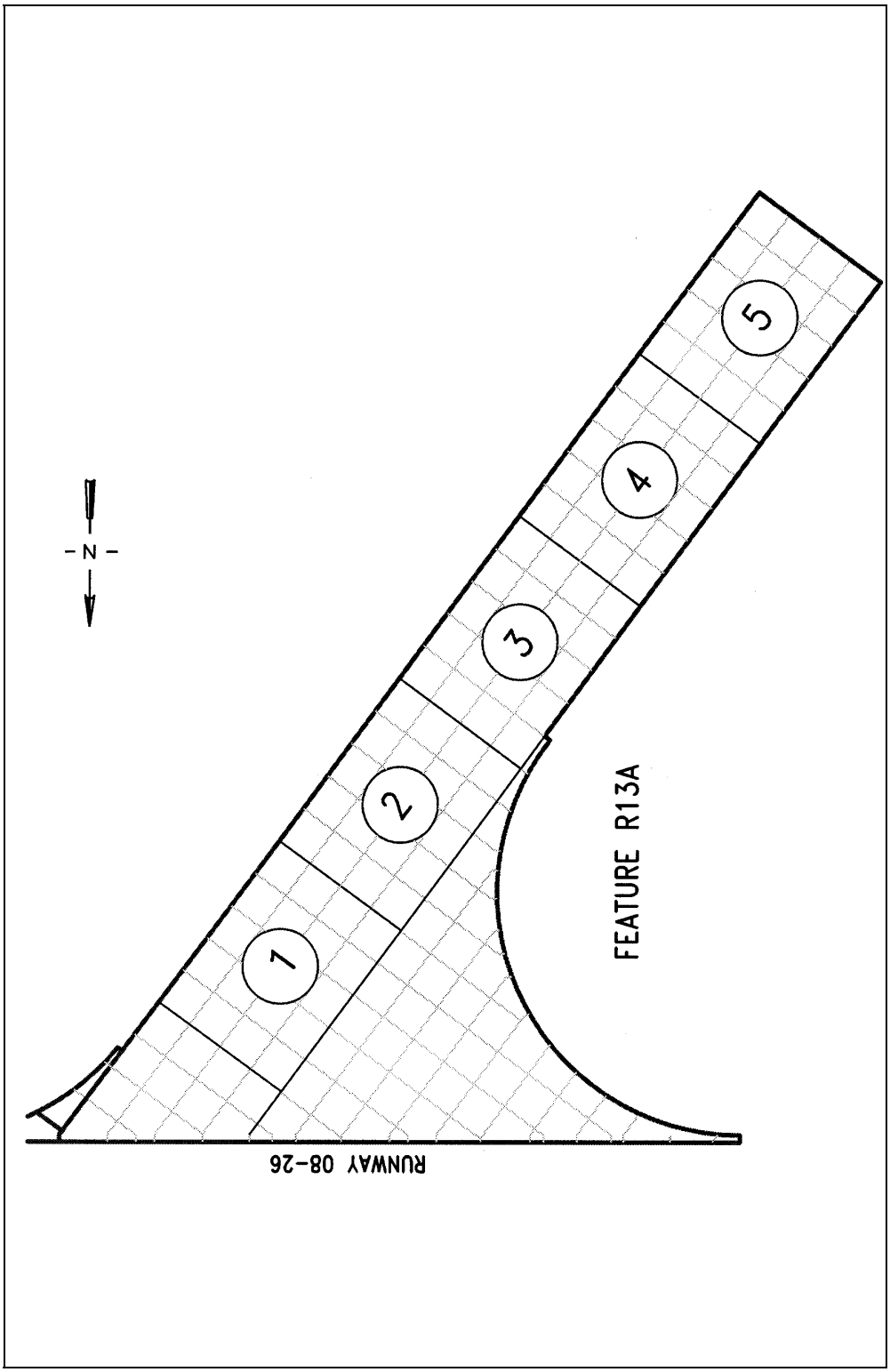

Figure C7. Sample unit layout, Runway 03-21, feature R13A

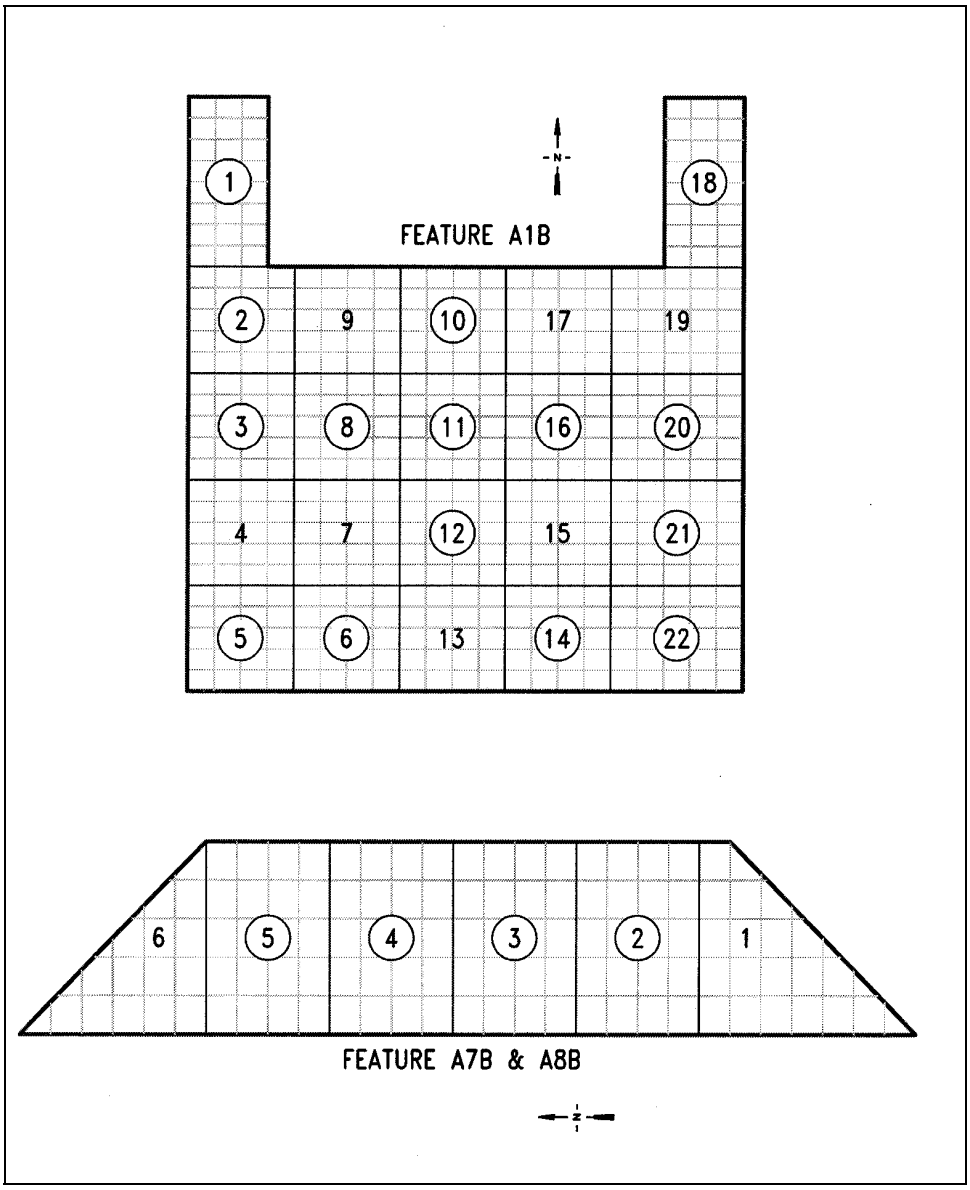

Figure C8. Sample unit layout, West Ramp and Warm-up Aprons 08 and 21, features A1B, A7B, and A8B

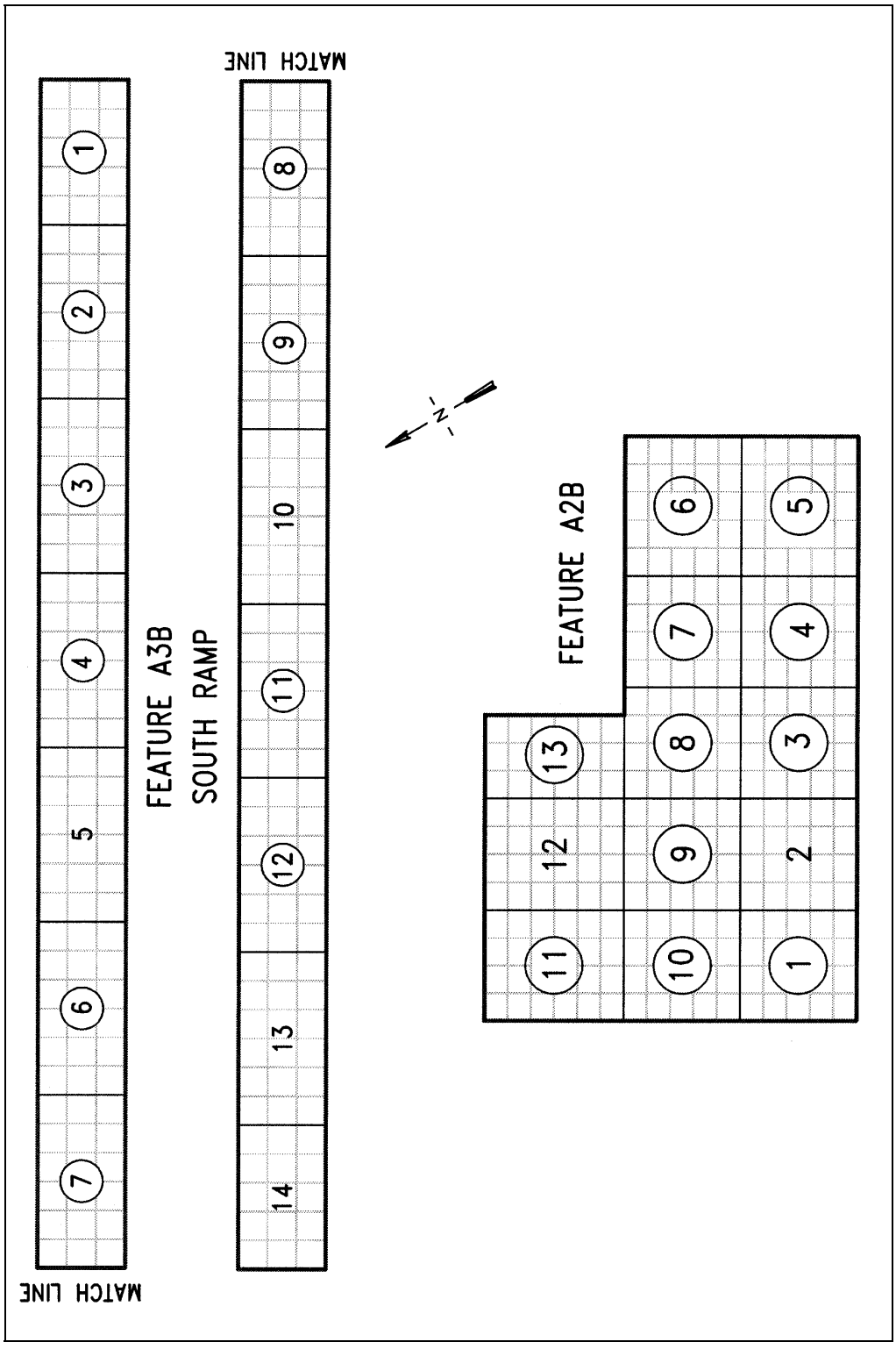

Figure C9. Sample unit layout, Tower Apron and South Ramp, features A2B and A3B

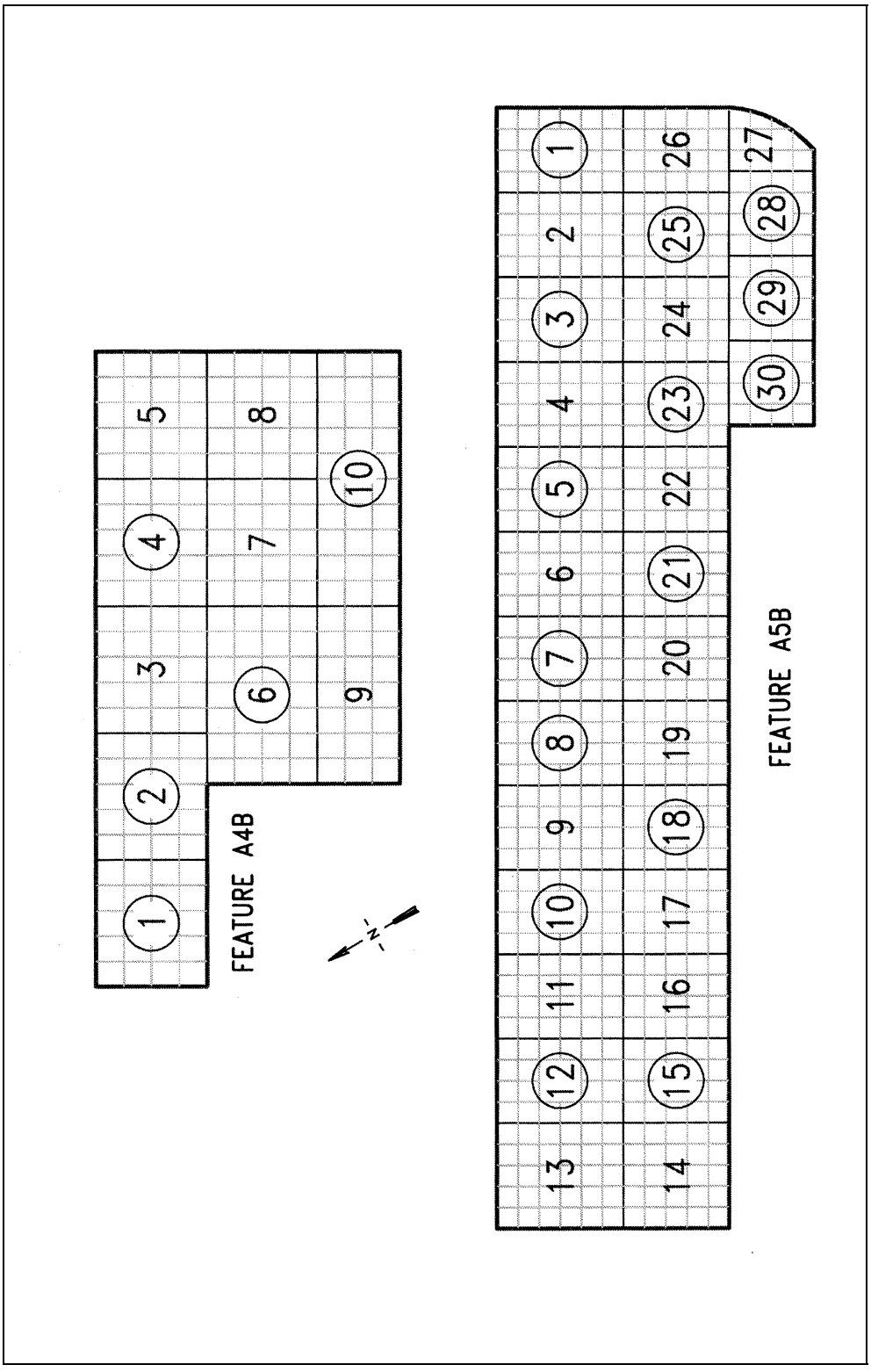

Figure C10. Sample unit layout, Tower Apron and Main Ramp, features A4B and A5B

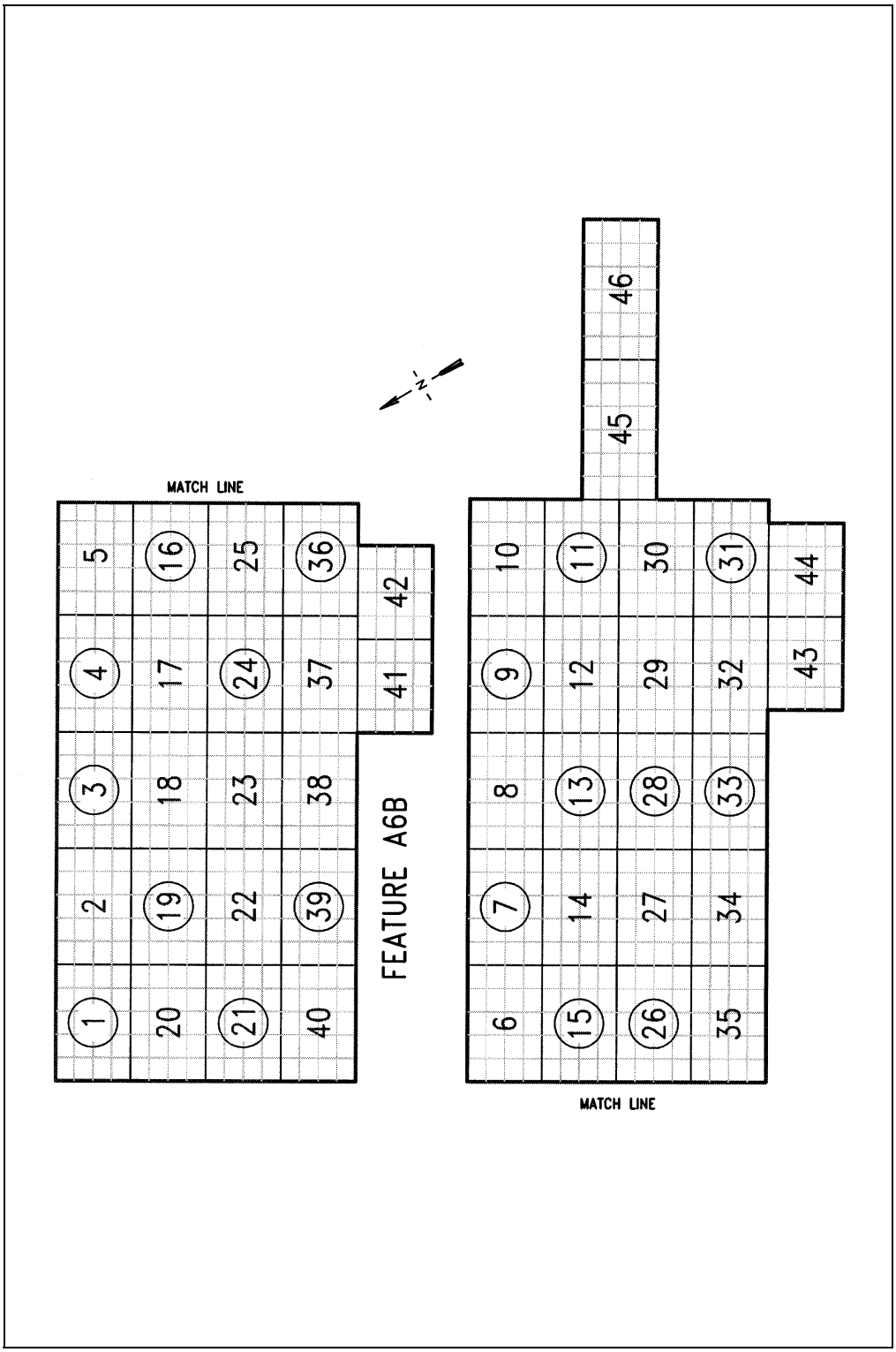

Figure C11. Sample unit layout, Hangar Apron feature A6B

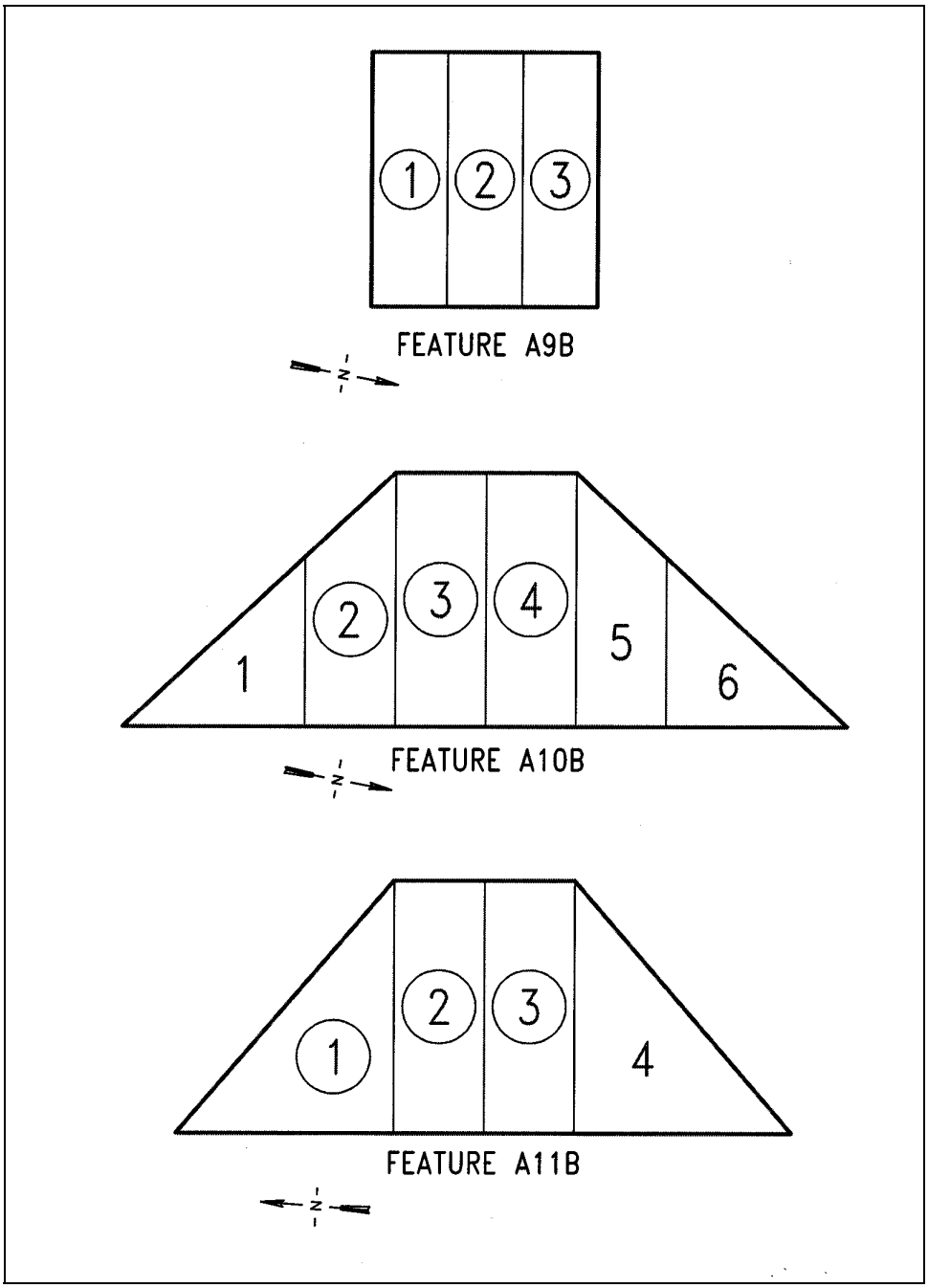

Figure C12. Sample unit layout, Warm-up Aprons 21, 12, and 30, features A9B, A10B, and A11B

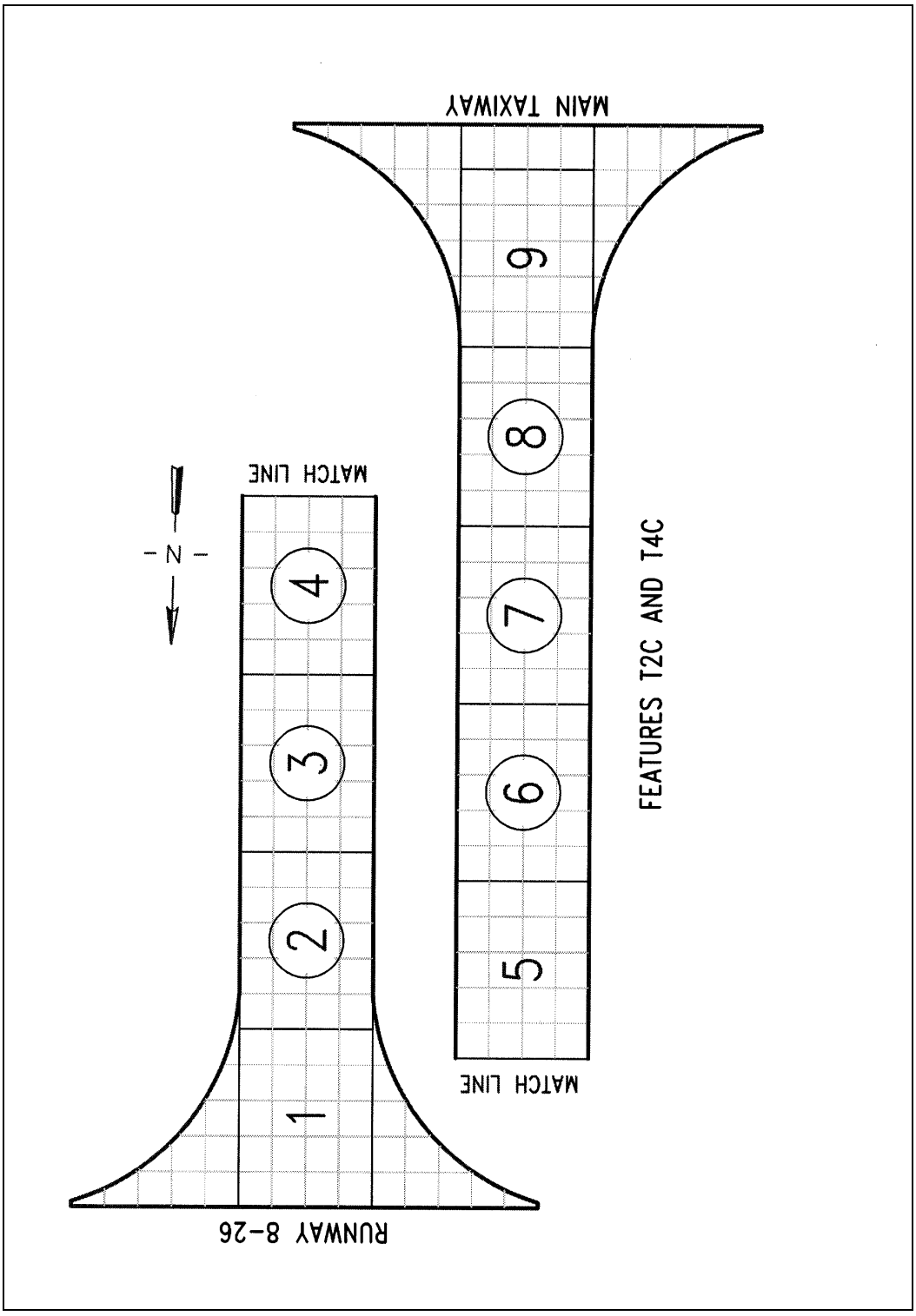

Figure C13. Sample unit layout, Taxiways B and D 01, features T2C and T4C

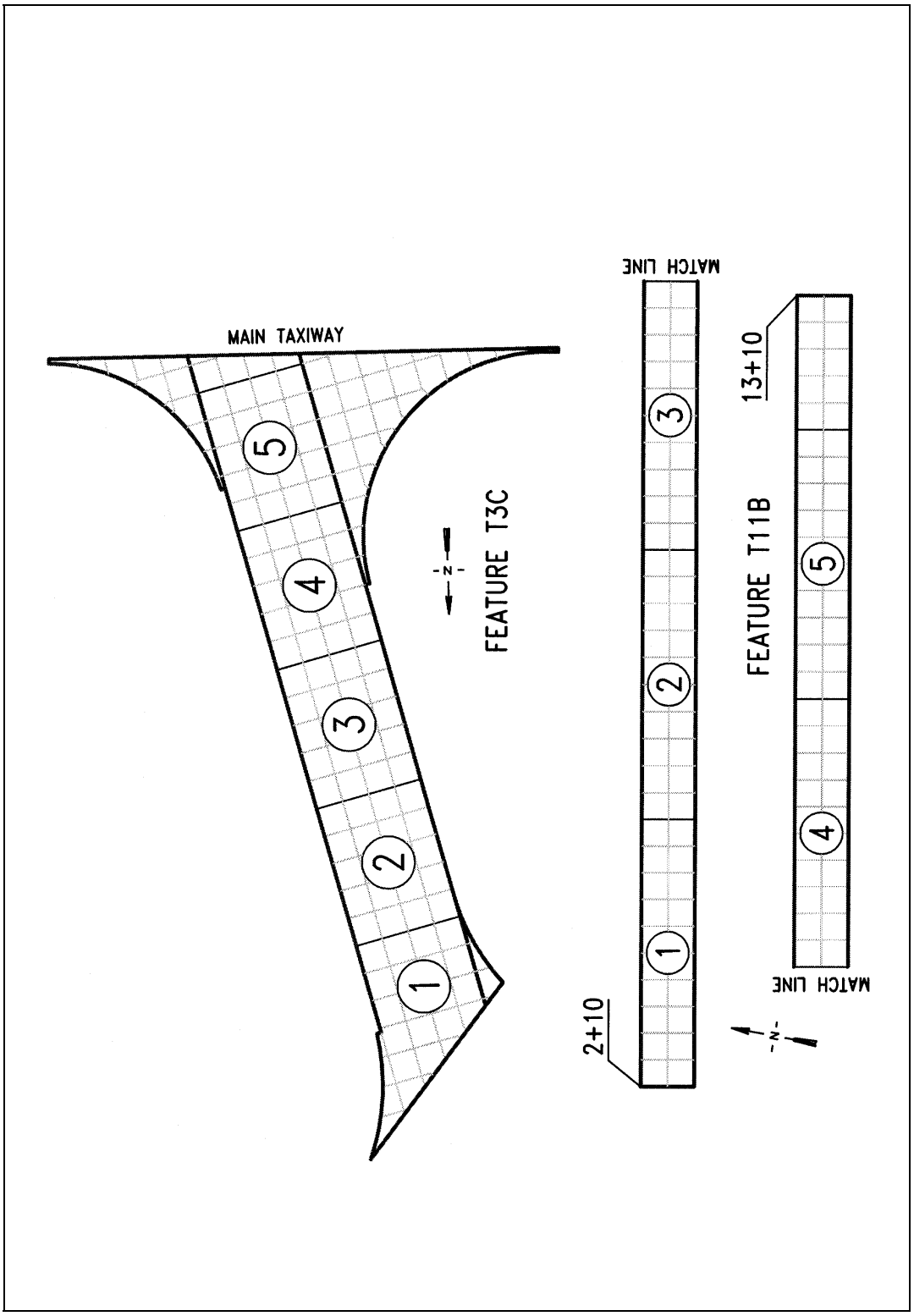

Figure C14. Sample unit layout, Taxiway C 02 and South Ramp taxiway, features T3C and T11B

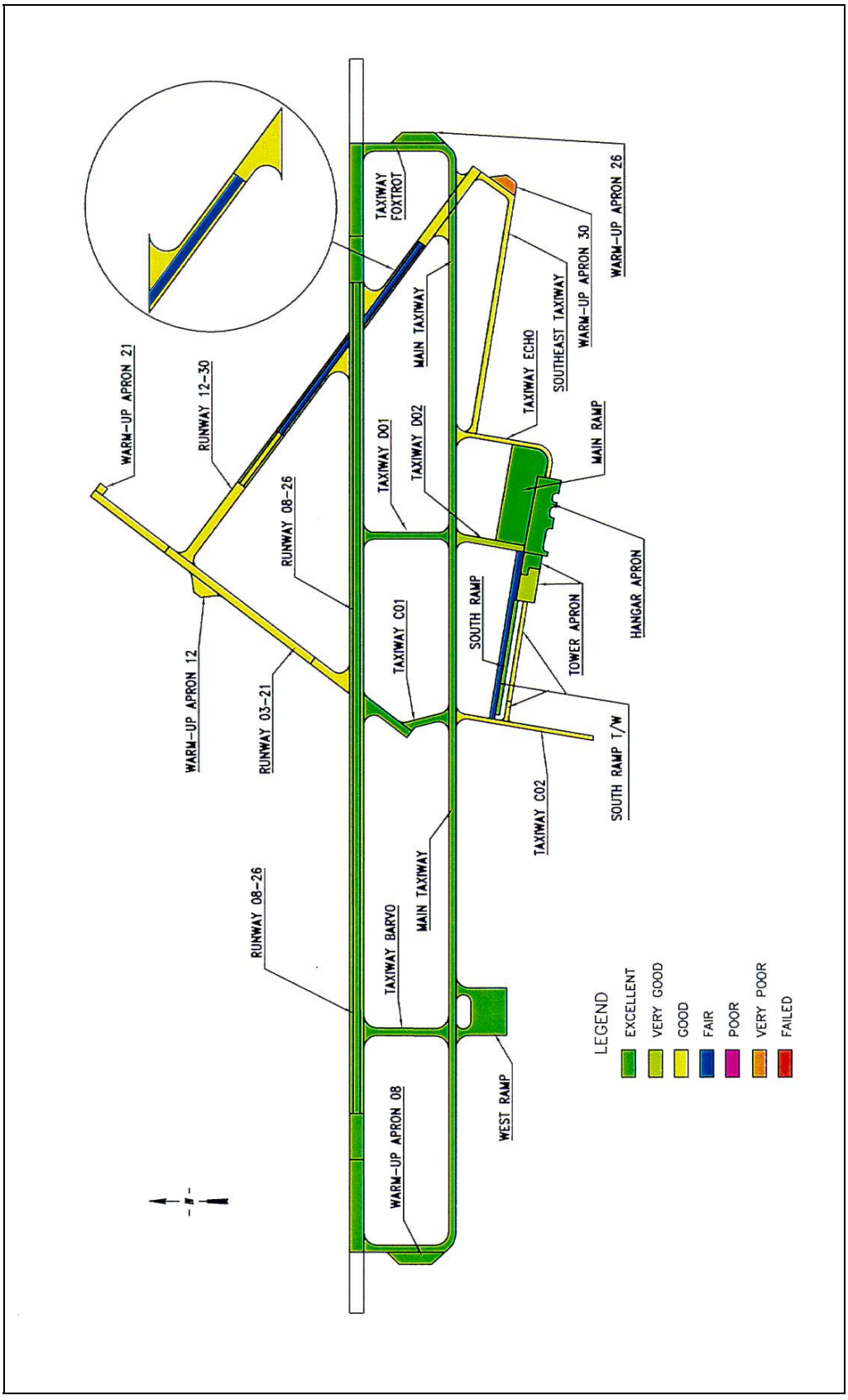

Figure C15. Pavement condition rating summary

Table C1
PCI Summary

Feature	2002 PCI	2002 Rating	Pavement Type
R1A	95	Excellent	PCC
R2C	98	Excellent	PCC
R3C	99	Excellent	PCC
R14C	100	Excellent	PCC
R4C	94	Excellent	PCC
R5A	97	Excellent	PCC
R6A	60	Good	AC
R7C	48	Fair	AC
R15C	59	Good	AC
R8C	65	Good	AC
R16C	66	Good	AC
R9A	62	Good	AC
R10A	67	Good	AC
R11C	66	Good	AC
R12A	66	Good	AC
R13A	99	Excellent	PCC
T1A	94	Excellent	PCC
T2C	100	Excellent	PCC
T3C	100	Excellent	PCC
T4C	99	Excellent	PCC
T4B	72	Very good	AC
T5B	64	Good	AC
T6A	91	Excellent	PCC
T7B	66	Good	AC
T8B	49	Fair	AC
T9B	59	Good	AC
T11B	69	Good	PCC
T10B	58	Good	AC
A1B	88	Excellent	PCC
A2B	77	Very good	PCC
A3B	93	Excellent	PCC
A4B	95	Excellent	PCC
A5B	94	Excellent	PCC
A6B	91	Excellent	PCC
A7B	92	Excellent	PCC
A8B	97	Excellent	PCC
A9B	69	Good	AC
A10B	69	Good	AC
A11B	25	Very poor	AC

Photo C1. Runway 12-30, Feature R7C, low-severity alligator cracking

Photo C2. Runway 12-30, Feature R7C, low-severity block cracking

Photo C3. Runway 12-30, Feature R16C, medium-severity linear cracking

Photo C4. Main taxiway, Feature T1A, low-severity linear cracking

Photo C5. Main taxiway, Feature R17C, low-severity joint spall

Photo C6. Taxiway D 02, Feature T4B, low-severity alligator cracking

Photo C7. Taxiway F, Feature T6A, low-severity linear cracking

Photo C8. Taxiway E, Feature T10B, medium-severity linear cracking

Photo C9. South Ramp taxiway, Feature T11B, high-severity joint seal damage

Photo C10. Hangar Apron, Feature A6B, medium-severity linear cracking

Appendix D
Structural Analyses

General

The performance of the airfield pavement facilities was analyzed for the mixture of traffic shown in Table A4.

The mixture of aircraft traffic listed in Table A4 was converted to equivalent traffic of the critical aircraft based on the procedure outlined in TM 5-825-2/ DM 21.3/AFM 88-6, Chapter 2 (Headquarters, Departments of the Army, the Air Force, and the Navy 1978). The critical aircraft is defined as that aircraft within a mixture of various aircraft operating at a facility that will impose a more severe combination of gear load and tire pressure than the other assigned aircraft at their respective pass levels. For the projected aircraft traffic mixture, the critical aircraft within the mixture was determined and the number of passes of the critical aircraft required to produce an effect on the pavement equivalent to the total mixture of traffic was computed. The current Corps of Engineers (CE) design criteria is utilized to analyze and equate the various aircraft loadings. PCC and AC pavements have different design criteria and, thus, a different number of equivalent operations of the design aircraft. The critical aircraft operating on the PCC and AC primary fixed-wing pavements was determined to be the C-17 aircraft.

The operational ACN values determined for the critical aircraft (263 Mg (580-kip) C-17 aircraft) are shown in Table D2 for the four subgrade strength categories.

In a wartime scenario, aircraft may be required to operate at weights that exceed normal peacetime loads. These aircraft would have a higher ACN, would cause more damage, and reduce the life of the pavement. A mobilization ACN can be determined from the appropriate ACN-PCN curve presented in ETL 1110-3-394 (Headquarters, Department of the Army 1991). Typical ACN-PCN curves for the C-17 and C-130 are shown in Figures D1 and D2, respectively. For contingency planning, it is often necessary to determine the largest aircraft that can safely land on an airfield. Runway length is a critical factor in this determination. Minimum take-off distances for maximum take-off weights of aircraft are also given in ETL 1110-3-394 (Headquarters, Department of the Army 1991). For a specified aircraft, the ACN can be determined from the ACN-PCN curve

and then the effect of the higher loads on the airfield can be determined from the ACN/PCN ratio. Specific aircraft mobilization traffic requirements are contained in classified mobilization plans and are not included in this report.

ACN-PCN Method of Reporting Pavement Structural Condition

The ACN-PCN method is structured so that the structural evaluation of a pavement for a particular aircraft can be accomplished by using the ratio of the aircraft ACN to the pavement PCN. For a given pavement life and a given number of operations of a particular aircraft, there is a relationship between the ACN/PCN ratio and the percent of pavement life used by the applied traffic. For a given ACN/PCN ratio, a relationship exists for the number of operations that will produce failure of the pavement. These relationships provide a method for evaluating a pavement for allowable load depending on an acceptable degree of damage to the pavement or an allowable number of operations of a particular aircraft to cause failure of a pavement. For aircraft having an ACN equal to the PCN, the predicted failure of the pavement would equal the design life of the pavement. Aircraft having ACNs higher than the pavement PCN would overload the pavement and decrease the life of the pavement. Likewise if the ACN of the operational aircraft were less than the pavement PCN, the life of the pavement would be greater than the design life. If the operational ACN is greater than the pavement PCN and a decrease in pavement life is not acceptable, then structural improvement of the pavement is required to bring the pavement PCN up to or greater than the operational ACN.

PCN Analysis

Modulus values shown in Appendix B were input into the computerized Layered Elastic Evaluation Program (LEEP) to determine the load-carrying capacity of each pavement feature in accordance with UFC 3-260-03 (Headquarters, Departments of the Army, Navy, and the Air Force 2001). Using the design aircraft and traffic levels for normal operations, a PCN was determined for each pavement feature. The PCN is determined using the allowable gross aircraft load and the subgrade strength category. To determine the subgrade category, back-calculated subgrade moduli were converted to CBR values using the correlation $E = 1500\ (CBR)$. Table D3 presents a summary of the evaluation of each pavement feature in terms of allowable gross aircraft loadings, PCN, and overlay thicknesses required to increase the structural capacity such that the mission traffic can be supported (PCN $\geq$ operational ACN). The Airfield Pavement Evaluation Chart (APEC) presented in Illustration 1, Executive Summary, shows a layout of the airfield pavements and corresponding PCN for each facility.

The PCN codes and PCI for each feature were analyzed to establish ISR ratings listed in Table 3-1. An ISR Rating for each pavement facility is shown in Illustration 2, Executive Summary. AR 420-72 (Headquarters Department of the

Army 2000) requires that the following ACN/PCN ratios be used in determining ISR ratings for airfield pavement facilities.

ACN/PCN ≤ 1.0 equals an ISR Green rating
1.0 < ACN/PCN ≤ 1.5 equals an ISR Amber rating
ACN/PCN > 1.5 equals an ISR Red rating

For those features having a PCN< the required operational ACN, the additional pavement thickness (overlay) needed to support the mission traffic was computed. Although the required increase in pavement strength is presented as an overlay thickness, several other approaches could be considered. A detailed analysis will be required to select and design the most cost-effective repair or improvement alternative. It should be noted that although less than 102 mm (4-in.) -thick AC overlay requirements are indicated in Table D3, the following minimum thicknesses are recommended in UFC 3-260-2 (Headquarters, Departments of the Army, Navy, and the Air Force 2001) and are reflected in the overlay recommendations in Table 3-2:

a. 51 mm (2-in.) -thick minimum AC overlay over AC pavements.

b. 102 mm (4-in.) -thick minimum AC overlay over PCC pavements.

c. 152 mm (6-in.) -thick minimum PCC partially or nonbonded overlay.

d. 51 mm (2-in.) -thick minimum PCC fully bonded overlay over PCC pavements.

These minimum overlay requirements are required to control the degree of cracking which will occur in the base pavement (existing pavement) due to the application of the design traffic. If those features needing structural improvements are not upgraded in a timely manner pavement may deteriorate rapidly and result in damage to all pavement layers and an increase in cost for the necessary improvements. Excessive damage may also result in lengthy closures of the pavement facility.

The PCN codes for the weakest feature within each pavement facility are shown in Table D4. The PCN code includes the PCN numerical value, pavement type, subgrade category, allowable tire pressure, and method used to determine the PCN. An example of a PCN code is: 30/F/A/W/T, with 30 expressing the numerical PCN value, F indicating a flexible pavement, A indicating high strength subgrade, W indicating high-allowable tire pressure, and T indicating that the PCN value was obtained by a technical evaluation. Table D5 presents a description of the letter codes comprising the PCN code. Each PCN assumes that only the design aircraft will be used for the stated number of passes. Theoretically, if the PCN is equal to the ACN, the pavement should perform satisfactorily and require only routine maintenance through the length of the analysis period. There may be situations when it is necessary to overload a pavement, i.e., the ACN is greater than the PCN. Examples are emergency landings, short-term contingencies, exercises, and air shows. Pavements can usually support some overload; however, pavement life can be reduced. If the PCN were less than the

ACN, the ACN/PCN ratio would be greater than 1 and the pavement would be expected to fail before reaching the end of the analysis period. As a general rule, ACN/PCN ratios of up to 1.25 have minimal impact on pavement life. If the ACN/PCN ratio is between 1.25 and 1.50, aircraft operations should be limited to 10 passes and the pavement inspected after each operation. Aircraft operations resulting in an ACN/PCN ratio over 1.50 should not be allowed except for emergencies. An example of how to use the ACP/PCN method to determine if an aircraft will overload a pavement is shown below.

Example Problem

Runway 08-26, the Main, Southeast, and Echo taxiways, and the Main Ramp must be used for 1,000 passes of a C-17 aircraft operating at a take-off weight of 263 000 kg (580,000 lb). Find the weakest features on each facility and determine if they can support this traffic?

Solution

From Table D3, determine the weakest feature on R/W 08-26, the three taxiways and the Main Ramp; from Figure D1 determine the ACN of a 263 000 kg (580,000 lb) C-17, and then calculate the ACN/PCN ratio using the appropriate PCN from Table D3.

a. Runway 08-26.

Weakest feature is R1A (see Table D3)
PCN for R1A = 45/R/B/W/T
ACN for a 263 000 kg (580,000 lb) C-17 on a medium strength subgrade = 49/R/B/W/T (see Figure D1).
ACN/PCN ratio is 49/45 or 1.09; therefore the overload on R1A will have minimal impact on the pavement life.

b. Main taxiway (T1A).

PCN for T1A = 49/R/B/W/T
ACN for a C-17 on a medium strength subgrade = 49/R/B/W/T (see Figure D1).
ACN/PCN ratio is 49/49 or 1.00; therefore T1A should perform satisfactorily.

c. Southeast taxiway (T10B).

PCN for T10B = 23/F/A/W/T
ACN for a C-17 on a high strength subgrade = 49/F/A/W/T (see Figure D1).
ACN/PCN ratio is 49/23 or 2.13; therefore T10B should be limited to emergency C-17 traffic.

d. Taxiway E (T5B).

PCN for T5B = 20/F/A/W/T
ACN for a C-17 on a high strength subgrade = 49/F/A/W/T (see Figure D1).
ACN/PCN ratio is 49/20 or 2.45; therefore T5B should be limited to emergency C-17 traffic.

e. Main Ramp (A5B).

PCN for A5B = 31/R/B/W/T
ACN for a C-17 on a medium strength subgrade = 49/R/B/W/T (see Figure D1).
ACN/PCN ratio is 49/31 or 1.58; therefore A5B should also be limited to emergency C-17 traffic.

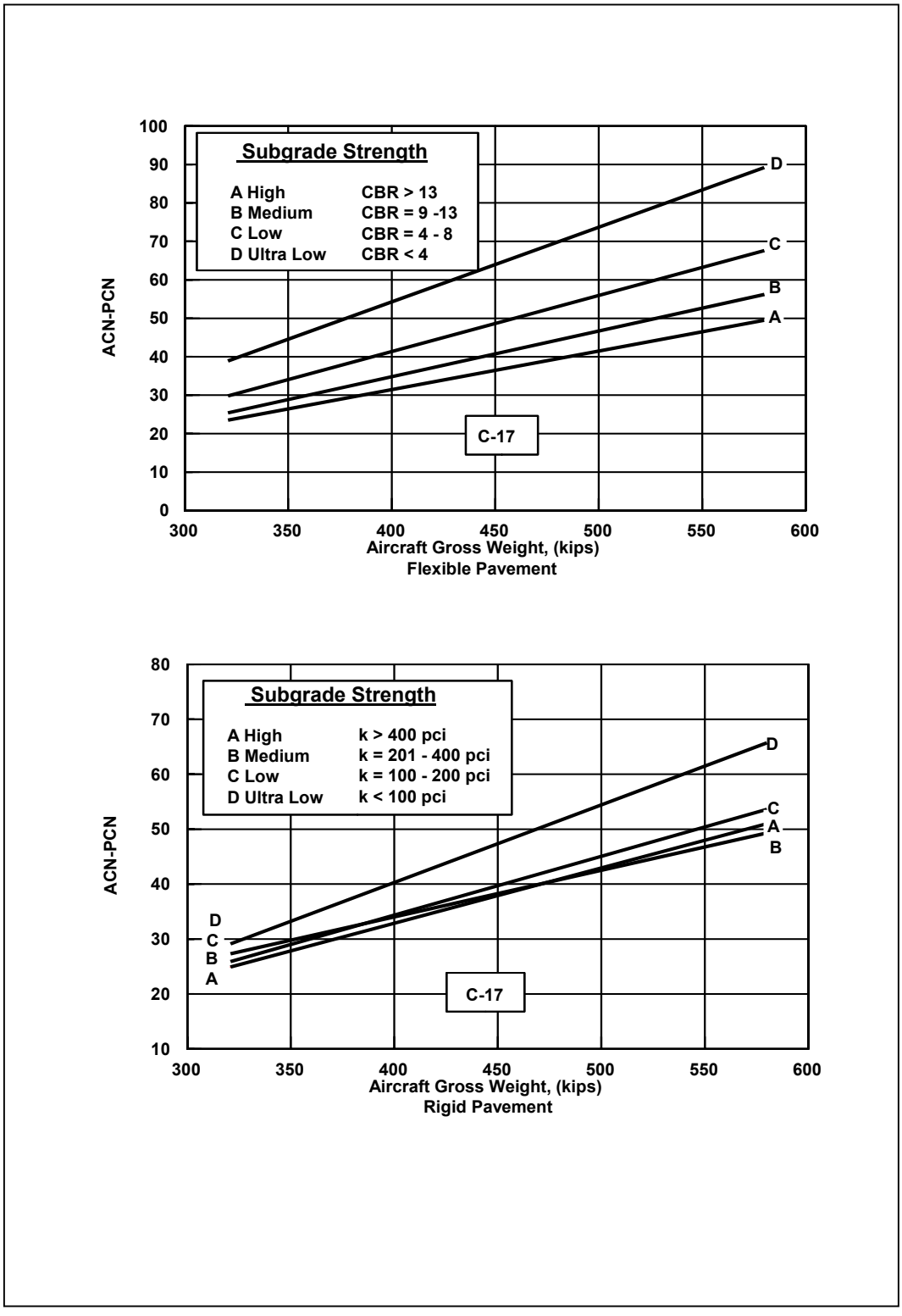

Figure D1. ACN-PCN curve for a C-17

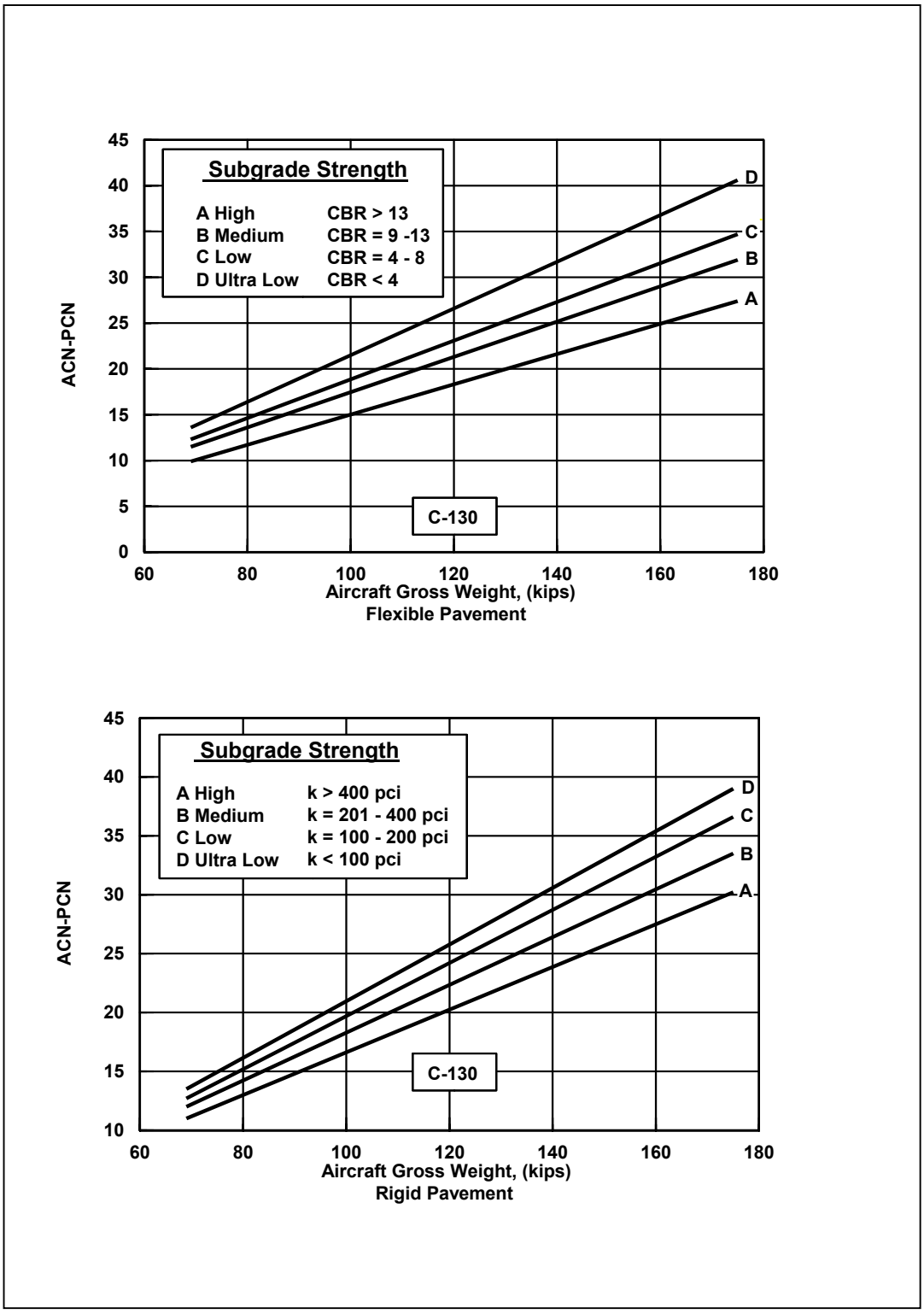

Figure D2. ACN-PCN curve for a C-130 aircraft

Table D1
Determination of Critical Aircraft and Design Traffic

AC Fixed-Wing Pavements			
Fixed-Wing Aircraft	**Gross Weight kg (lb)**	**20-year Projected Aircraft Passes**	**20-year Equivalent C-17 Passes**
C-130	70 300 (155,000)	26,400	23
C-17	263 080 (580,000)	5,860	5,280
C-5A	349 126 (769,000)	5,860	6
KC-135	136 926 (301,600)	5,860	354
20-year Total Equivalent C-17 passes @ 263 320 (580,000) = 6,243			
PCC Fixed-Wing Pavements			
Fixed-Wing Aircraft	**Gross Weight kg (lb)**	**20-year Projected Aircraft Passes**	**20-year Equivalent C-17 Passes**
C-130	70 300 (155,000)	26,400	81
C-17	263 080 (580,000)	5,860	5,860
C-5A	349 126 (769,000)	5,860	732
KC-135	136 926 (301,600)	5,860	146
20-year Total Equivalent C-17 passes @ 263 320 (580,000) = 6,819			

Table D2
Determination of ACN Values for the Critical Aircraft

Fixed-Wing AC Pavements			
Design Aircraft	**Weight kg (lb)**	**Subgrade Category[1]**	**ACN or Required PCN**
C-17	263 080 (580,000)	A B C D	49 56 68 89
Fixed-Wing PCC Pavements			
Design Aircraft	**Weight kg (lb)**	**Subgrade Category[1]**	**ACN or Required PCN**
C-17	263 080 (580,000)	A B C D	51 49 54 66
Fixed-Wing AC Pavements			
Design Aircraft	**Weight kg (lb)**	**Subgrade Category[1]**	**ACN or Required PCN**
C-130	70 300 (155,000)	A B C D	24 28 31 36
Fixed-Wing PCC Pavements			
Design Aircraft	**Weight kg (lb)**	**Subgrade Category[1]**	**ACN or Required PCN**
C-130	70 300 (155,000)	A B C D	27 30 33 35

[1] See Table D5 for subgrade category.

Table D3
Allowable Gross Aircraft Loads and Overlay Requirements for the Projected Day-To-Day Traffic

Pavement Facility	Feature	Test Number or Station m (ft)	Type Traffic Area	Subgrade Strength[1] CBR, % or K, kPa/mm (psi/in.)	Design Aircraft[2]				Allowable Gross Load Mg (kips)	PCN	Theoretical Overlay Requirements, mm (in.)		
					Aircraft	Weight Kg (lb)	Passes	ACN			AC	PCC Partial Bond	PCC No Bond
Runway 8-26	R1A	0+00-3+05 (0+00-10+00)	A	56 (208)	C-17	263 320 (580,000)	6,819	49/R/B/W/T	239 (526)	45/R/B/W/T	NA	69 (2.7)	132 (5.2)
	R2C	3+05-4+57 (10+00-15+00)	C	60 (221)	C-17	263 320 (580,000)	6,819	49/R/B/W/T	263 (580+)[3]	63/R/B/W/T	NA	0 (0.0)	0 (0.0)
	R3C	4+57-32+00 (15+00-105+00)	C	78 (289)	C-17	263 320 (580,000)	6,819	49/R/B/W/T	263 (580+)[3]	74/R/B/W/T	NA	0 (0.0)	0 (0.0)
	R4C	32+00-33+53 (105+00-110+00)	C	31 (114)	C-17	263 320 (580,000)	6,819	54/R/C/W/T	263 (580)	54/R/C/W/T	NA	0 (0.0)	0 (0.0)
	R5A	33+53-36+57 (110+00-120+00)	C	56 (206)	C-17	263 320 (580,000)	6,819	49/R/B/W/T	239 (526)	45/R/B/W/T	NA	69 (2.7)	132 (5.2)
Runway 12-30	R6A	0+00-3+05 (0+00-10+00)	A	20	C-17	263 320 (580,000)	6,243	49/F/A/W/T	167 (369)	28/F/A/W/T	109 (4.3)	NA	--[4]
	R7C	3+05-11+28 (10+00-37+00)	C	18	C-17	263 320 (580,000)	6,243	49/F/A/W/T	202 (446)	36/F/A/W/T	61 (2.4)	NA	--[4]
	R8C	11+28-13+41 (37+00-44+00)	C	19	C-17	263 320 (580,000)	6,243	49/F/A/W/T	220 (485)	40/F/A/W/T	41 (1.6)	NA	--[4]
	R9A	13+41-16+46 44+00-54+00	A	17	C-17	263 320 (580,000)	6,243	49/F/A/W/T	147 (324)	24/F/A/W/T	140 (5.5)	NA	--[4]
Runway 3-21	R10A	0+00-3+05 (0+00-10+00)	A	16	C-17	263 320 (580,000)	6,243	49/F/A/W/T	139 (306)	22/F/A/W/T	152 (6.0)	NA	--[4]
	R11C	3+05-9+14 (10+00-30+00)	C	14	C-17	263 320 (580,000)	6,243	49/F/A/W/T	159 (351)	27/F/A/W/T	112 (4.4)	NA	--[4]
	R12A	9+14-10+82 (30+00-35+50)	A	17	C-17	263 320 (580,000)	6,243	49/F/A/W/T	149 (328)	24/F/A/W/T	135 (5.3)	NA	--[4]
	R13A	11+28-12+98 (37+00-42+60)	A	75 (277)	C-17	263 320 (580,000)	6,819	49/R/B/W/T	263 (580+)[3]	53/R/B/W/T	NA	0 (0.0)	0 (0.0)
Main Taxiway	T1A	0+00-37+37 (0+00-122+60)	A	74 (272)	C-17	263 320 (580,000)	6,819	49/R/B/W/T	263 (580)	49/R/B/W/T	NA	0 (0.0)	0 (0.0)

(Sheet 1 of 3)

[1] Values based on correlations between CBR and/or k and the backcalculated subgrade modulus.

[2] Determined for the critical aircraft (see Table D1).

[3] The allowable gross load is greater than the maximum take-off weight of the critical aircraft.

[4] Was not calculated because feature was evaluated as a flexible pavement.

Table D3 (Continued)

Pavement Facility	Feature	Test Number or Station m (ft)	Type Traffic Area	Subgrade Strength[1] CBR, % or K, kPa/mm (psi/in.)	Design Aircraft[2]				Allowable Gross Load Mg (kips)	PCN	Theoretical Overlay Requirements, mm (in.)		
					Aircraft	Weight Kg (lb)	Passes	ACN			AC	PCC Partial Bond	PCC No Bond
Taxiway B	T2C	0+00-2+86 (0+00-9+37)	C	90 (331)	C-17	263 320 (580,000)	6,819	49/R/B/W/T	263 (580+)[3]	77/R/B/W/T	NA	0 (0.0)	0 (0.0)
Taxiway C 01	T3C	0+00-1+55 (0+00-5+10)	C	75 (277)	C-17	263 320 (580,000)	6,819	49/R/B/W/T	263 (580+)[3]	73/R/B/W/T	NA	0 (0.0)	0 (0.0)
Taxiway C 02	T7B	0+00-4+51 (0+00-14+80)	C	21	C-17	263 320 (580,000)	6,243	49/F/A/W/T	167 (368)	28/F/A/W/T	135 (5.3)	NA	--[4]
Taxiway D 01	T4C	0+00-2+86 (0+00-9+37)	C	108 (399)	C-17	263 320 (580,000)	6,819	49/R/B/W/T	263 (580+)[3]	82/R/B/W/T	NA	0 (0.0)	0 (0.0)
Taxiway D 02	T4B	0+00-2+26 (0+00-7+42)	B	17	C-17	263 320 (580,000)	6,243	49/F/A/W/T	138 (305)	22/F/A/W/T	188 (7.4)	NA	--[4]
Taxiway E	T5B	0+00-3+24 (0+00-11+23)	B	17	C-17	263 320 (580,000)	6,243	49/F/A/W/T	127 (281)	20/F/A/W/T	211 (8.3)	NA	--[4]
Taxiway F	T6A	0+00-4+27 (0+00-14+00)	A	56 (207)	C-17	263 320 (580,000)	6,819	49/R/B/W/T	263 (580)	49/R/B/W/T	NA	0 (0.0)	0 (0.0)
South Ramp Taxiway	T8B	0+00-5+58 (0+00-18+31)	B	17	C-17	263 320 (580,000)	6,243	49/F/A/W/T	118 (260)	18/F/A/W/T	239 (9.4)	NA	--[4]
	T9B	0+00-0+69 (0+00-2+27)	B	16	C-17	263 320 (580,000)	6,243	49/F/A/W/T	109 (241)	16/F/A/W/T	259 (10.2)	NA	--[4]
	T11B	0+69-3+96 (2+27-13+00)	B	41 (153)	C-17	263 320 (580,000)	6,819	54/R/C/W/T	133 (293)	23/R/C/W/T	NA	251 (9.9)	305 (12.0)
Southeast Taxiway	T10B	0+00-8+84 (0+00-29+00)	B	17	C-17	263 320 (580,000)	6,243	49/F/A/W/T	141 (311)	23/F/A/W/T	183 (7.2)	NA	--[4]
West Ramp	A1B	1-20	B	95 (349)	C-17	263 320 (580,000)	6,819	49/R/B/W/T	263 (580+)[3]	54/R/B/W/T	NA	0 (0.0)	0 (0.0)
Tower Apron	A2B	1-12	B	87 (321)	C-17	263 320 (580,000)	6,819	49/R/B/W/T	149 (329)	28/R/B/W/T	NA	2.6 (8.1)	262 (10.3)

(Sheet 2 of 3)

[1] Values based on correlations between CBR and/or k and the backcalculated subgrade modulus.
[2] Determined for the critical aircraft (see Table D1).
[3] The allowable gross load is greater than the maximum take-off weight of the critical aircraft.
[4] Was not calculated because feature was evaluated as a flexible pavement.

Table D3 (Concluded)

Pavement Facility	Feature	Test Number or Station m (ft)	Type Traffic Area	Subgrade Strength[1] CBR, % or K, kPa/mm (psi/in.)	Design Aircraft[2]				Allowable Gross Load Mg (kips)	PCN	Theoretical Overlay Requirements, mm (in.)		
					Aircraft	Weight Kg (lb)	Passes	ACN			AC	PCC Partial Bond	PCC No Bond
South Ramp	A3B	1-14	B	78 (287)	C-17	263 320 (580,000)	6,819	49/R/B/W/T	175 (386)	33/R/B/W/T	NA	145 (5.7)	203 (8.0)
Tower Apron	A4B	1-10	B	105 (388)	C-17	263 320 (580,000)	6,819	49/R/B/W/T	188 (414)	35/R/B/W/T	NA	127 (5.0)	185 (7.3)
Main Ramp	A5B	1-29	B	72 (265)	C-17	263 320 (580,000)	6,819	49/R/B/W/T	165 (363)	31/R/B/W/T	NA	198 (7.8)	272 (10.7)
Hangar Apron	A6B	1-22	B	55 (204)	C-17	263 320 (580,000)	6,819	49/R/B/W/T	126 (277)	24/R/B/W/T	NA	251 (9.9)	312 (12.3)
Warm-Up Apron 26	A7B	1-6	B	45 (167)	C-17	263 320 (580,000)	6,819	54/R/C/W/T	218 (481)	43/R/C/W/T	NA	117 (4.6)	193 (7.6)
Warm-Up Apron 08	A8B	1-6	B	48 (184)	C-17	263 320 (580,000)	6,819	54/R/C/W/T	225 (497)	44/R/C/W/T	NA	99 (3.9)	173 (6.8)
Warm-Up Apron 21	A9B	1-3	B	16	C-17	263 320 (580,000)	6,243	49/F/A/W/T	126 (277)	19/F/A/W/T	211 (8.3)	NA	--[4]
Warm-Up Apron 12	A10B	1-3	B	18	C-17	263 320 (580,000)	6,243	49/F/A/W/T	143 (315)	23/F/A/W/T	179 (7.0)	NA	--[4]
Warm-Up Apron 30	A11B	1-4	B	15	C-17	263 320 (580,000)	6,243	49/F/A/W/T	94 (208)	12/F/A/W/T	323 (12.7)	NA	--[4]

(Sheet 3 of 3)

[1] Values based on correlations between CBR and/or k and the backcalculated subgrade modulus.
[2] Determined for the critical aircraft (see Table D1).
[3] The allowable gross load is greater than the maximum take-off weight of the critical aircraft.
[4] Was not calculated because feature was evaluated as a flexible pavement.

Table D4
Summary of Pavement Classification Numbers

Pavement Facility	Controlling Feature	PCN[1] Code
Fixed-Wing Pavements		
Runway 08-26[2] (Ends)	R1A	45/R/B/W/T
Runway 08-26[2] (Interior)	R4C	54/R/C/W/T
Runway 12-30	R9A	24/F/A/W/T
Runway 03-21	R10A	22/F/A/W/T
Main Taxiway	T1A	49/R/B/W/T
Taxiway B	T2C	77/R/B/W/T
Taxiway C 01	T3C	73/R/B/W/T
Taxiway C 02	T7B	28/F/A/W/T
Taxiway D 01	T4C	82/R/B/W/T
Taxiway D 02	T4B	22/F/A/W/T
Taxiway E	T5B	20/F/A/W/T
Taxiway F	T6A	49/R/B/W/T
South Ramp Taxiway	T9B	16/F/A/W/T
Southeast Taxiway	T10B	23/F/A/W/T
West Ramp	A1B	54/R/B/W/T
Tower Apron	A2B	28/R/B/W/T
South Ramp	A3B	33/R/B/W/T
Main Ramp	A5B	31/R/B/W/T
Hangar Apron	A6B	24/R/B/W/T
Warm-up Apron 26	A7B	43/R/C/W/T
Warm-up Apron 08	A8B	44/R/C/W/T
Warm-up Apron 22	A9B	19/F/A/W/T
Warm-up Apron 12	A10B	23/F/A/W/T
Warm-up Apron 30	A11B	12/F/A/W/T

[1] Table D5 describes the components of the PCN code.
[2] The PCN of the center 2743 m (9,000 ft) portion of R/W 8-26 (Feature R4C) is 54/R/C/W/T.

Table D5
PCN Five-Part Code

PCN	Pavement Type	Subgrade Strength[1]	Tire Pressure2	Method of PCN Determination
Numerical value	R - rigid	A	W	T - technical evaluation
	F - flexible	B	X	U - using aircraft
		C	Y	
		D	Z	

[1]Code	Category	Flexible Pavement CBR, %	Rigid Pavement K, kPa/mm, (psi/in.)
A	High	〈 13	〈 108 (400)
B	Medium	13 > CBR 〈 8	108 > K 〈 54 (400 > K 〈 200)
C	Low	8 > CBR 〈 4	54 > K 〈 27 (200 > K 〈 100)
D	Ultra-low	< 4	< 27 (< 100)

[2]Code	Category	Tire Pressure, MPa (psi)
W	High	No limit
X	Medium	1.0 - 1.5 (146 - 217)
Y	Low	0.51 - 1.0 (73 - 145)
Z	Ultra-low	0 - 0.5 (0 - 72)

Appendix E
Micro PAVER Output Summary

```
Network ID      - LIBBY
Branch Name     - RUNWAY 08-26              Slab Length     -   20.00 LF
Branch Number   - R1A                       Slab Width      -   25.00 LF
Section Number  - 1    Family - DEFAULT     Number of Slabs -   300

================================================================================

  --------------------------------------------------------------------------
  Inspection Date: MAR/25/2002
  Riding Quality :            Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:              F.O.D.:
  --------------------------------------------------------------------------

  PCI OF SECTION =  95                              RATING = EXCELLENT

  TOTAL NUMBER OF SAMPLE UNITS =    20
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    13
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  5.2%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE

  63 LINEAR CR      LOW           6 (SLABS)         2.05         2.17
  65 JT SEAL DAM    LOW         277 (SLABS)        92.31         2.00
  66 SMALL PATCH    LOW           5 (SLABS)         1.54         0.39
  73 SHRINKAGE CR   N/A          12 (SLABS)         4.10         0.97
  74 JOINT SPALL    LOW           5 (SLABS)         1.54         1.29


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =  32.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =  29.00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES =  39.00 PERCENT DEDUCT VALUES.
```

```
Network ID      - LIBBY
Branch Name     - RUNWAY 08-26              Slab Length     -     20.00 LF
Branch Number   - R2C                       Slab Width      -     25.00 LF
Section Number  - 1    Family - DEFAULT     Number of Slabs -     150

================================================================================

  --------------------------------------------------------------------------
  Inspection Date: MAR/25/2002
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:              F.O.D.:
  --------------------------------------------------------------------------

  PCI OF SECTION =  98                              RATING = EXCELLENT

  TOTAL NUMBER OF SAMPLE UNITS =    10
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    6
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  2.7%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE

  66 SMALL PATCH    MEDIUM        2 (SLABS)         1.11         0.67
  73 SHRINKAGE CR   N/A           3 (SLABS)         2.22         0.80
  74 JOINT SPALL    LOW           3 (SLABS)         2.22         1.56


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES = 100.00 PERCENT DEDUCT VALUES.
```

```
Network ID      - LIBBY
Branch Name     - RUNWAY 08-26              Slab Length     -     20.00 LF
Branch Number   - R3C                       Slab Width      -     18.75 LF
Section Number  - 1    Family - DEFAULT     Number of Slabs -     1,800

================================================================================

  --------------------------------------------------------------------------
  Inspection Date: MAR/25/2002
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:              F.O.D.:
  --------------------------------------------------------------------------

  PCI OF SECTION =  99                              RATING = EXCELLENT

  TOTAL NUMBER OF SAMPLE UNITS =    90
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    25
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  1.4%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE

  66 SMALL PATCH    LOW          14 (SLABS)         1.00         0.15
  66 SMALL PATCH    HIGH          4 (SLABS)         1.00         2.00
  74 JOINT SPALL    LOW           7 (SLABS)         1.00         0.60


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES = 100.00 PERCENT DEDUCT VALUES.
```

```
Network ID      - LIBBY
Branch Name     - RUNWAY 08-26              Slab Length     -     20.00 LF
Branch Number   - R14C                      Slab Width      -     18.75 LF
Section Number  - 1    Family - DEFAULT     Number of Slabs -     1,800

================================================================================

  --------------------------------------------------------------------------
  Inspection Date: MAR/25/2002
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:              F.O.D.:
  --------------------------------------------------------------------------

  PCI OF SECTION =  100                              RATING = EXCELLENT

  TOTAL NUMBER OF SAMPLE UNITS =    90
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    25
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  0.1%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE

  66 SMALL PATCH    LOW           7 (SLABS)         1.00         0.15



      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES = 100.00 PERCENT DEDUCT VALUES.
```

```
Network ID      - LIBBY
Branch Name     - RUNWAY 08-26              Slab Length     -     20.00 LF
Branch Number   - R4C                       Slab Width      -     25.00 LF
Section Number  - 1    Family - DEFAULT     Number of Slabs -     150
```

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Inspection Date: MAR/25/2002
Riding Quality : Safety: Drainage Cond.:
Shoulder Cond. : Overall Cond.: F.O.D.:

PCI OF SECTION = 94 RATING = EXCELLENT

TOTAL NUMBER OF SAMPLE UNITS = 10
NUMBER OF RANDOM SAMPLE UNITS SURVEYED = 6
NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED = 0
RECOMMENDED MINIMUM OF 5 RANDOM SAMPLE UNITS TO BE SURVEYED.
STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED = 8.3%

*** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

DISTRESS-TYPE	SEVERITY	QUANTITY	DENSITY %	DEDUCT VALUE
63 LINEAR CR	LOW	5 (SLABS)	3.33	3.31
65 JT SEAL DAM	HIGH	25 (SLABS)	16.67	2.00
66 SMALL PATCH	LOW	3 (SLABS)	2.22	0.44
73 SHRINKAGE CR	N/A	10 (SLABS)	6.67	1.24
74 JOINT SPALL	LOW	3 (SLABS)	2.22	1.56
74 JOINT SPALL	MEDIUM	2 (SLABS)	1.11	1.37

*** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

LOAD RELATED DISTRESSES = 17.00 PERCENT DEDUCT VALUES.
CLIMATE/DURABILITY RELATED DISTRESSES = 60.00 PERCENT DEDUCT VALUES.
OTHER RELATED DISTRESSES = 23.00 PERCENT DEDUCT VALUES.

```
Network ID      - LIBBY
Branch Name     - RUNWAY 08-26              Slab Length     -     20.00 LF
Branch Number   - R5A                       Slab Width      -     25.00 LF
Section Number  - 1    Family - DEFAULT     Number of Slabs -     300

================================================================================

  --------------------------------------------------------------------------
  Inspection Date: MAR/25/2002
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:              F.O.D.:
  --------------------------------------------------------------------------

  PCI OF SECTION =  97                              RATING = EXCELLENT

  TOTAL NUMBER OF SAMPLE UNITS =    20
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =   13
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  2.7%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE

  63 LINEAR CR      LOW           2 (SLABS)         1.00         1.00
  73 SHRINKAGE CR   N/A          23 (SLABS)         7.69         1.34
  74 JOINT SPALL    LOW          11 (SLABS)         3.59         1.84
  75 CORNER SPALL   LOW           2 (SLABS)         1.00         0.30


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =  22.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES =  78.00 PERCENT DEDUCT VALUES.
```

```
Network ID      - LIBBY
Branch Name     - RUNWAY 12-30              Section Length  -   1000.00 LF
Branch Number   - R6A                       Section Width   -    100.00 LF
Section Number  - 1    Family - DEFAULT     Section Area    - 100000.00 SF

================================================================================

  --------------------------------------------------------------------------
  Inspection Date: MAR/25/2002
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  --------------------------------------------------------------------------

  PCI OF SECTION =  60                              RATING = GOOD

  TOTAL NUMBER OF SAMPLE UNITS =    20
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    9
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  3.5%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***


  43 BLOCK CR       LOW         81026.00 (SF)       81.03         33.26
  48 L & T CR       LOW           855.00 (LF)        0.86          4.66
  42 WEATH/RAVEL    LOW         99895.00 (LF)       99.89         26.34



      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***
  LOAD              RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES = 100.00 PERCENT DEDUCT VALUES.
  OTHER             RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
```

```
Network ID      - LIBBY
Branch Name     - RUNWAY 12-30              Section Length  -   2700.00 LF
Branch Number   - R7C                       Section Width   -     50.00 LF
Section Number  - 1    Family - DEFAULT     Section Area    - 135000.00 SF

================================================================================

  --------------------------------------------------------------------------
  Inspection Date: MAR/25/2002
  Riding Quality :            Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:              F.O.D.:

  --------------------------------------------------------------------------

  PCI OF SECTION =  48                                RATING = FAIR

  TOTAL NUMBER OF SAMPLE UNITS =    27
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    11
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF 14 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  13.3%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE

  41 ALLIGATOR CR  LOW          2697.00 (SF)        2.00         27.08
  43 BLOCK CR      LOW        134858.00 (SF)       99.89         35.58
  52 WEATH/RAVEL   LOW        134858.00 (SF)       99.89         26.34
  53 RUTTING       LOW           959.00 (SF)        0.71         13.94
  53 RUTTING       MEDIUM       1468.00 (SF)        1.09         24.88

      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD                RELATED DISTRESSES =  52.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY  RELATED DISTRESSES =  48.00 PERCENT DEDUCT VALUES.
  OTHER               RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
```

```
 Network ID      - LIBBY
Branch Name     - RUNWAY 12-30              Section Length  -   2700.00 LF
Branch Number   - R15C                      Section Width   -     50.00 LF
Section Number  - 1    Family - DEFAULT     Section Area    - 135000.00 SF

================================================================================

  --------------------------------------------------------------------------
  Inspection Date: MAR/25/2002
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:

  --------------------------------------------------------------------------

  PCI OF SECTION =  59                                RATING = GOOD

  TOTAL NUMBER OF SAMPLE UNITS =    27
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    13
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF 5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  0.0%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE


  43 BLOCK CR       LOW         134858.00 (SF)      99.89         35.58
  52 WEATH/RAVEL    LOW         134858.00 (SF)      99.89         26.34


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD                 RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY   RELATED DISTRESSES = 100.00 PERCENT DEDUCT VALUES.
  OTHER                RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
```

```
Network ID      - LIBBY
Branch Name     - RUNWAY 12-30              Section Length  -   700.00 LF
Branch Number   - R8C                       Section Width   -    50.00 LF
Section Number  - 1    Family - DEFAULT     Section Area    - 35000.00 SF

================================================================================

  --------------------------------------------------------------------------
  Inspection Date: MAR/25/2002
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:

  --------------------------------------------------------------------------

  PCI OF SECTION =  65                                RATING = GOOD

  TOTAL NUMBER OF SAMPLE UNITS =    7
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    5
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  4.8%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE

  43 BLOCK CR       LOW          10489.00 (SF)      29.97         24.17
  48 L&T CR         LOW            595.00 (LF)       1.70         13.94
  50 PATCHING       LOW             11.00 (SF)       0.10          2.00
  52 WEATH/RAVEL    LOW          34963.00 (SF)      99.98         26.34



      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD                RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
 CLIMATE/DURABILITY   RELATED DISTRESSES = 100.00 PERCENT DEDUCT VALUES.
 OTHER                RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
```

```
 Network ID      - LIBBY
Branch Name     - RUNWAY 12-30              Section Length  -    700.00 LF
Branch Number   - R16C                      Section Width   -     50.00 LF
Section Number  - 1    Family - DEFAULT     Section Area    -  35000.00 SF

================================================================================

  --------------------------------------------------------------------------
  Inspection Date: MAR/25/2002
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:

  --------------------------------------------------------------------------

  PCI OF SECTION =  66                                RATING = GOOD

  TOTAL NUMBER OF SAMPLE UNITS =    7
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    5
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF 5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  3.4%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE

  48 L & T CR       LOW           1105.00 (LF)       3.16         10.45
  48 L & T CR       MEDIUM         308.00 (LF)       0.88         10.61
  50 PATCHING       LOW                22 (SF)       0.10          2.00
  52 WEATH/RAVEL    LOW          34963.00 (SF)      99.89         26.34


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD                RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY  RELATED DISTRESSES = 100.00 PERCENT DEDUCT VALUES.
  OTHER               RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
```

```
Network ID      - LIBBY
Branch Name     - RUNWAY 12-30              Section Length  -   1000.00 LF
Branch Number   - R9A                       Section Width   -    100.00 LF
Section Number  - 1    Family - DEFAULT     Section Area    - 100000.00 SF

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  --------------------------------------------------------------------------
  Inspection Date: MAR/25/2002
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:

  --------------------------------------------------------------------------

  PCI OF SECTION =  62                                RATING = GOOD

  TOTAL NUMBER OF SAMPLE UNITS =    20
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    9
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =    0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  4.9%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE

  43 BLOCK CR       LOW           51057 (SF)      51.06          28.67
  48 L & T CR       LOW          2931.00 (LF)      2.93           9.87
  48 L & T CR       MEDIUM        489.00 (LF)      0.49           8.21
  52 WEATH/RAVEL    LOW            99895 (SF)     99.89          26.34



      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD                RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY  RELATED DISTRESSES = 100.00 PERCENT DEDUCT VALUES.
  OTHER               RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
```

```
 Network ID      - LIBBY
 Branch Name     - RUNWAY 3-21               Section Length  -   1000.00
LF
 Branch Number   - R10A                      Section Width   -     75.00
LF
 Section Number  - 1    Family - DEFAULT     Section Area    -  75000.00
SF

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   ------------------------------------------------------------------------
   Inspection Date: MAR/25/2002
   Riding Quality :             Safety:       Drainage Cond.:
   Shoulder Cond. :      Overall Cond.:               F.O.D.:
   ------------------------------------------------------------------------

   PCI OF SECTION =  67                              RATING = GOOD

   TOTAL NUMBER OF SAMPLE UNITS =    10
   NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    5
   NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =    0
   RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
   STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  2.3%


          *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

   DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE
   48 L & T CR       LOW         3700.00 (LF)      4.93          14.63
   50 PATCHING       LOW          460.00 (SF)      0.61           2.70
   52 WEATH/RAVEL    LOW            74975 (SF)     99.97          26.35



       *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

   LOAD                 RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
   CLIMATE/DURABILITY   RELATED DISTRESSES = 100.00 PERCENT DEDUCT VALUES.
   OTHER                RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
```

```
 Network ID      - LIBBY
 Branch Name     - RUNWAY 3-21               Section Length  -   2000.00
LF
 Branch Number   - R11C                      Section Width   -     75.00
LF
 Section Number  - 1    Family - DEFAULT     Section Area    - 150000.00
SF

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   ------------------------------------------------------------------------
   Inspection Date: MAR/25/2002
   Riding Quality :             Safety:       Drainage Cond.:
   Shoulder Cond. :      Overall Cond.:              F.O.D.:

   ------------------------------------------------------------------------

   PCI OF SECTION =  66                              RATING = GOOD

   TOTAL NUMBER OF SAMPLE UNITS =    20
   NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    8
   NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =    0
   RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
   STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  3.8%


          *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

   DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE

   43 BLOCK CR       LOW           13745 (SF)      9.16          16.53
   48 L & T CR       LOW          5237.00 (LF)     3.49          11.29
   50 PATCHING       LOW           422.00 (SF)     0.28           2.09
   52 WEATH/RAVEL    LOW           149950 (SF)    99.97          26.35


       *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

   LOAD                RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
   CLIMATE/DURABILITY  RELATED DISTRESSES = 100.00 PERCENT DEDUCT VALUES.
   OTHER               RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
```

```
 Network ID      - LIBBY
 Branch Name     - RUNWAY 3-21               Section Length  -    550.00
LF
 Branch Number   - R12A                      Section Width   -     75.00
LF
 Section Number  - 1    Family - DEFAULT     Section Area    -  41250.00
SF

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   ------------------------------------------------------------------------
   Inspection Date: MAR/25/2002
   Riding Quality :            Safety:       Drainage Cond.:
   Shoulder Cond. :      Overall Cond.:              F.O.D.:

   ------------------------------------------------------------------------

   PCI OF SECTION =  66                                RATING = GOOD

   TOTAL NUMBER OF SAMPLE UNITS =    6
   NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    5
   NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =    0
   RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
   STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  6.3%


          *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

   DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE

   43 BLOCK CR       LOW            6873 (SF)     16.66           20.03
   48 L & T CR       LOW          550.00 (LF)      1.33            5.70
   50 PATCHING       LOW           99.00 (SF)      0.24            2.05
   52 WEATH/RAVEL    LOW           41236 (SF)     99.97           26.35


       *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

   LOAD                RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
   CLIMATE/DURABILITY  RELATED DISTRESSES = 100.00 PERCENT DEDUCT VALUES.
   OTHER               RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
```

```
Network ID      - LIBBY
Branch Name     - RUNWAY 3-21              Slab Length     -     20.00 LF
Branch Number   - R13A                     Slab Width      -     18.75 LF
Section Number  - 1    Family - DEFAULT    Number of Slabs -     112


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  ------------------------------------------------------------------------
  Inspection Date: MAR/25/2002
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  ------------------------------------------------------------------------

  PCI OF SECTION =  99                              RATING = EXCELLENT

  TOTAL NUMBER OF SAMPLE UNITS =    5
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    5
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  0.9%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE

  66 SMALL PATCH    LOW           1 (SLABS)        1.00           0.15
  74 JOINT SPALL    LOW           1 (SLABS)        1.00           0.60


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES = 100.00 PERCENT DEDUCT VALUES.
```

```
Network ID      - LIBBY
Branch Name     - MAIN TAXIWAY              Slab Length     -     20.00 LF
Branch Number   - T1A                        Slab Width      -     25.00 LF
Section Number  - 1    Family - DEFAULT     Number of Slabs -     1839

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  --------------------------------------------------------------------------
  Inspection Date: MAR/25/2002
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:              F.O.D.:
  --------------------------------------------------------------------------

  PCI OF SECTION =  94                              RATING = EXCELLENT

  TOTAL NUMBER OF SAMPLE UNITS =    122
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    30
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    5RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  5.6%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE

  63 LINEAR CR      LOW           49(SLABS)        2.64           2.71
  65 JT SEAL DAM    LOW         1839 (SLABS)      100.00           2.00
  66 SMALL PATCH    LOW           37 (SLABS)        2.00           0.43
  67 LARGE PATCH    LOW            4 (SLABS)        1.00           0.75
  73 SHRINKAGE CR   LOW          108 (SLABS)        9.78           1.54
  75 JOINT SPALL    LOW            4 (SLABS)        1.00           0.60


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =  34.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =  25.00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES =  41.00 PERCENT DEDUCT VALUES.
```

```
Network ID      - LIBBY
Branch Name     - TAXIWAY BRAVO             Slab Length     -     20.00 LF
Branch Number   - T2C                        Slab Width      -     18.75 LF
Section Number  - 1    Family - DEFAULT     Number of Slabs -     184

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  --------------------------------------------------------------------------
  Inspection Date: MAR/25/2002
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:              F.O.D.:
  --------------------------------------------------------------------------

  PCI OF SECTION =  100                              RATING = EXCELLENT

  TOTAL NUMBER OF SAMPLE UNITS =    9
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    6
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =    0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  0.0%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE




      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
```

```
Network ID      - LIBBY
Branch Name     - TAXIWAY CHARLIE 01        Slab Length     -     20.00 LF
Branch Number   - T3C                       Slab Width      -     18.75 LF
Section Number  - 1    Family - DEFAULT     Number of Slabs -     102

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  --------------------------------------------------------------------------
  Inspection Date: MAR/25/2002
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:              F.O.D.:
  --------------------------------------------------------------------------

  PCI OF SECTION =  100                              RATING = EXCELLENT

  TOTAL NUMBER OF SAMPLE UNITS =    5
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    5
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =    0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  0.0%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE




      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
```

```
 Network ID      - LIBBY
 Branch Name     - TAXIWAY CHARLIE 02         Section Length  -   1480.00
LF
 Branch Number   - T7B                        Section Width   -     40.00
LF
 Section Number  - 1    Family - DEFAULT     Section Area     -  59200.00
SF

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   ------------------------------------------------------------------------
   Inspection Date: MAR/25/2002
   Riding Quality :             Safety:       Drainage Cond.:
   Shoulder Cond. :      Overall Cond.:               F.O.D.:

   ------------------------------------------------------------------------

   PCI OF SECTION =  66                                RATING = GOOD

   TOTAL NUMBER OF SAMPLE UNITS =    15
   NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    7
   NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =    0
   RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
   STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  5.6%


          *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

   DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE

   41 ALLIGATOR CR   LOW             253 (SF)      0.43           13.26
   48 L & T CR       LOW          1739.00 (LF)     2.94            9.89
   48 L & T CR       MEDIUM        239.00 (LF)     0.40            7.52
   52 WEATH/RAVEL    LOW            59138 (SF)    99.97           26.35


       *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

   LOAD                RELATED DISTRESSES =  23.00 PERCENT DEDUCT VALUES.
   CLIMATE/DURABILITY  RELATED DISTRESSES =  77.00 PERCENT DEDUCT VALUES.
   OTHER               RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
```

```
Network ID      - LIBBY
Branch Name     - TAXIWAY DELTA 01          Slab Length     -    20.00 LF
Branch Number   - T4C                       Slab Width      -    18.75 LF
Section Number  - 1    Family - DEFAULT     Number of Slabs -     184

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  --------------------------------------------------------------------------
  Inspection Date: MAR/25/2002
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:              F.O.D.:
  --------------------------------------------------------------------------

  PCI OF SECTION =  99                              RATING = EXCELLENT

  TOTAL NUMBER OF SAMPLE UNITS =    9
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    6
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  1.5%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE

  62 CORNER BREAK   LOW           2 (SLABS)         1.00        0.70
  66 SMALL PATCH    LOW           2 (SLABS)         1.00        0.15
  75 CORNER SPALL   LOW           2 (SLABS)         1.00        0.30


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =  61.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES =  39.00 PERCENT DEDUCT VALUES.
```

```
Network ID      - LIBBY
Branch Name     - TAXIWAY DELTA 02          Section Length  -   742.00 LF
Branch Number   - T4B                       Section Width   -    75.00 LF
Section Number  - 1    Family - DEFAULT      Section Area   - 55650.00 SF

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  ------------------------------------------------------------------------
  Inspection Date: MAR/25/2002
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:              F.O.D.:
  ------------------------------------------------------------------------

  PCI OF SECTION =  72                              RATING = VERY GOOD

  TOTAL NUMBER OF SAMPLE UNITS =    7
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    5
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  6.0%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE

  41 ALLIGATOR CR   LOW           505.00 (SF)      0.91          19.58
  43 BLOCK CR       LOW          2068.00 (SF)      3.72          12.31
  48 L & T CR       LOW           119.00 (LF)      0.21           3.20
  52 WEATH/RAVEL    LOW          5170.00 (SF)      9.29           9.46




      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =  44.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =  56.00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
```

```
Network ID      - LIBBY
Branch Name     - TAXIWAY ECHO              Section Length  -   1123.00 LF
Branch Number   - T5B                       Section Width   -     75.00 LF
Section Number  - 1    Family - DEFAULT     Section Area    -  84225.00 SF

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  --------------------------------------------------------------------------
  Inspection Date: MAR/25/2002
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:              F.O.D.:
  --------------------------------------------------------------------------

  PCI OF SECTION =  64                              RATING = GOOD

  TOTAL NUMBER OF SAMPLE UNITS =    11
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    5
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    6 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  8.7%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE

  41 ALLIGATOR CR   LOW           673.00 (SF)      0.80          18.44
  48 L & T CR       LOW          7036.00 (LF)      8.36          20.89
  48 L & T CR       MEDIUM         67.00 (LF)      0.10           4.00
  52 WEATH/RAVEL    LOW         84136.00 (SF)     99.89          26.34



      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =  26.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =  74.00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
```

```
 Network ID      - LIBBY
Branch Name     - TAXIWAT FOXTROT           Slab Length     -    20.00 LF
Branch Number   - T6A                       Slab Width      -    25.00 LF
Section Number  - 1    Family - DEFAULT     Number of Slabs -     210
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  ------------------------------------------------------------------------
  Inspection Date: MAR/25/2002
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  ------------------------------------------------------------------------

  PCI OF SECTION =  91                              RATING = EXCELLENT

  TOTAL NUMBER OF SAMPLE UNITS =    14
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    9
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =    0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  7.5%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE

  63 LINEAR BREAK   LOW          20 (SLABS)         9.63        8.32
  65 JT SEAL DMG    LOW          93 (SLADS)        44.44        2.00
  66 SMALL PATCH    LOW           2 (SLABS)         1.00        0.15
  73 SHRINKAGE CR   LOW          22 (SLABS)        10.37        1.60
  74 JOINT SPALL    LOW           3 (SLABS)         1.48        1.25


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =  63.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =  15.00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES =  22.00 PERCENT DEDUCT VALUES.
```

```
Network ID      - LIBBY
Branch Name     - SOUTH RAMP TAXIWAY       Section Length  -   1831.00 LF
Branch Number   - T8B                      Section Width   -     40.00 LF
Section Number  - 1    Family - DEFAULT    Section Area    -  73240.00 SF

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  --------------------------------------------------------------------------
  Inspection Date: MAR/25/2002
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:              F.O.D.:
  --------------------------------------------------------------------------

  PCI OF SECTION =  49                              RATING = FAIR

  TOTAL NUMBER OF SAMPLE UNITS =    18
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    9
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    7 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  8.5%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE

  41 ALLIGATOR CR  LOW             1118 (SF)      1.53          24.47
  43 BLOCK CR      LOW         73163.00 (SF)     99.89          35.58
  48 L & T CR      LOW            20.00 (LF)      0.10           2.50
  48 L & T CR      MEDIUM        234.00 (LF)      0.32           6.69
  52 WEATH/RAVEL   LOW         73163.00 (SF)     99.89          26.34


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD                RELATED DISTRESSES =  26.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY  RELATED DISTRESSES =  74.00 PERCENT DEDUCT VALUES.
  OTHER               RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
```

```
Network ID      - LIBBY
Branch Name     - SOUTH RAMP TAXIWAY       Section Length  -    227.00 LF
Branch Number   - T9B                      Section Width   -     40.00 LF
Section Number  - 1    Family - DEFAULT    Section Area    -   9080.00 SF

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  ------------------------------------------------------------------------
  Inspection Date: MAR/25/2002
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:              F.O.D.:
  ------------------------------------------------------------------------

  PCI OF SECTION =  59                              RATING = GOOD

  TOTAL NUMBER OF SAMPLE UNITS =    2
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    2
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    2 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  10.0%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE

  43 BLOCK CR       LOW          9070.00 (SF)     99.89         35.58
  52 WEATH/RAVEL    LOW          9070.00 (SF)     99.89         26.34



      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD                RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY  RELATED DISTRESSES = 100.00 PERCENT DEDUCT VALUES.
  OTHER               RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
```

```
Network ID      - LIBBY
Branch Name     - SOUTH RAMP TAXIWAY             SLAB Length  -   20.00 LF
Branch Number   - T11B                           SLAB Width   -   20.00 LF
Section Number  - 1    Family - DEFAULT    Number of Slabs    -  110


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  ------------------------------------------------------------------------
  Inspection Date: MAR/25/2002
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  ------------------------------------------------------------------------

  PCI OF SECTION =  69                                RATING = GOOD

  TOTAL NUMBER OF SAMPLE UNITS =    6
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    5
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =    0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  12.9%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE

  63 LINEAR CR      LOW          10 (SLABS)        9.00          7.89
  63 LINEAR CR      MEDIUM        7 (SLABS)        6.00         13.23
  63 LINEAR CR      HIGH          1 (SLABS)        1.00          3.50
  65 JT SEAL DMG    HIGH        110 (SLABS)      100.00         12.00
  66 SMALL PATCH    LOW           7 (SLABS)        6.00          0.60
  66 SMALL PATCH    MEDIUM        4 (SLABS)        4.00          2.19
  73 SHRINKAGE CR   LOW           9 (SLABS)        8.00          1.37
  75 CORNER SPALL   LOW           1 (SLABS)        1.00          0.30
  75 CORNER SPALL   MEDIUM        3 (SLABS)        3.00          2.06
  75 CORNER SPALL   HIGH          1 (SLABS)        1.00          1.20

      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD                RELATED DISTRESSES =  56.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY  RELATED DISTRESSES =  27.00 PERCENT DEDUCT VALUES.
  OTHER               RELATED DISTRESSES =  17.00 PERCENT DEDUCT VALUES.
```

```
Network ID      - LIBBY
Branch Name     - SOUTHEAST TAXIWAY        Section Length  -   2900.00 LF
Branch Number   - T10B                     Section Width   -     50.00 LF
Section Number  - 1    Family - DEFAULT    Section Area    - 145000.00 SF

================================================================================

  ------------------------------------------------------------------------
  Inspection Date: MAR/25/2002
  Riding Quality :            Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:              F.O.D.:
  ------------------------------------------------------------------------

  PCI OF SECTION =  58                              RATING = GOOD

  TOTAL NUMBER OF SAMPLE UNITS =    29
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =   11
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    10 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED = 10.7%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE

  41 ALLIGATOR CR   LOW             3555 (SF)      2.45          29.09
  43 BLOCK CR       LOW         32920.00 (SF)     22.70          22.12
  48 L & T CR       LOW             7626 (LF)      5.26          15.32
  48 L & T CR       MEDIUM           817 (LF)      0.56           8.74
  50 PATCHING       LOW              508  (SF)      0.35           2.19
  52 WEATH/RAVEL    LOW         144847.00 (SF)     99.89          26.34


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD                RELATED DISTRESSES =  28.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY  RELATED DISTRESSES =  72.00 PERCENT DEDUCT VALUES.
  OTHER               RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
```

```
Network ID      - LIBBY
Branch Name     - West Ramp                        SLAB Length  -   25.00 LF
Branch Number   - A1B                              SLAB Width   -   20.00 LF
Section Number  - 1    Family - DEFAULT    Number of Slabs    -  468
```

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  ------------------------------------------------------------------------
  Inspection Date: MAR/25/2002
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  ------------------------------------------------------------------------

  PCI OF SECTION =  88                                RATING = EXCELLENT

  TOTAL NUMBER OF SAMPLE UNITS =    22
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    15
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =    0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  12.9%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE

  63 LINEAR CR      LOW          14 (SLABS)        3.10          3.09
  63 LINEAR CR      MEDIUM        1 (SLABS)        1.00          1.00
  65 JT SEAL DMG    LOW         468(SLABS)      100.00          2.00
  66 SMALL PATCH    LOW           7 (SLABS)        1.55          0.39
  66 SMALL PATCH    MEDIUM        4 (SLABS)        1.00          0.60
  67 SMALL PATCH    LOW           9 (SLABS)        1.86          1.62
  73 SHRINKAGE CR   LOW         119 (SLABS)       25.39          3.49
  74 JOINT SPALL    LOW           7 (SLABS)        1.55          1.29
  74 JOINT SPALL    MEDIUM        1 (SLABS)        1.00          1.00
  75 CORNER SPALL   HIGH          1 (SLABS)        1.00          1.20


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD                RELATED DISTRESSES =  26.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY  RELATED DISTRESSES =  13.00 PERCENT DEDUCT VALUES.
  OTHER               RELATED DISTRESSES =  61.00 PERCENT DEDUCT VALUES.
```

```
Network ID      - LIBBY
Branch Name     - TOWER APRON                    SLAB Length  -   15.00 LF
Branch Number   - A2B                            SLAB Width   -   12.50 LF
Section Number  - 1    Family - DEFAULT    Number of Slabs    -  276


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  ------------------------------------------------------------------------
  Inspection Date: MAR/25/2002
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  ------------------------------------------------------------------------

  PCI OF SECTION =  77                               RATING = GOOD

  TOTAL NUMBER OF SAMPLE UNITS =    13
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    11
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =    0
  RECOMMENDED MINIMUM OF    7 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  10.1%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE

  62 CORNER BREAK   LOW           2 (SLABS)        1.00          0.70
  63 LINEAR CR      LOW          26 (SLABS)        9.48          8.22
  63 LINEAR CR      MEDIUM        4 (SLABS)        1.29          2.78
  65 JT SEAL DMG    LOW          48 (SLABS)       17.24          2.00
  65 JT SEAL DMG    MEDIUM      228 (SLABS)       82.76          7.00
  66 SMALL PATCH    LOW          20 (SLABS)        7.33          0.75
  67 LARGE PATCH    LOW          12 (SLABS)        4.31          2.74
  73 SHRINKAGE CR   LOW          57 (SLABS)       20.69          2.81
  74 JOINT SPALL    LOW          11 (SLABS)        3.88          1.90
  74 JOINT SPALL    MEDIUM        4 (SLABS)        1.29          1.81
  75 CORNER SPALL   LOW           2 (SLABS)        1.00          0.30
  75 CORNER SPALL   MEDIUM        1 (SLABS)        1.00          0.80

      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD                RELATED DISTRESSES =  37.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY  RELATED DISTRESSES =  28.00 PERCENT DEDUCT VALUES.
  OTHER               RELATED DISTRESSES =  35.00 PERCENT DEDUCT VALUES.
```

```
Network ID      - LIBBY
Branch Name     - SOUTH RAMP                    SLAB Length  -   15.00 LF
Branch Number   - A3B                           SLAB Width   -   15.00 LF
Section Number  - 1    Family - DEFAULT    Number of Slabs    -  264


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  ------------------------------------------------------------------------
  Inspection Date: MAR/25/2002
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  ------------------------------------------------------------------------

  PCI OF SECTION =  93                              RATING = EXCELLENT

  TOTAL NUMBER OF SAMPLE UNITS =  14
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =   10
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =    0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  5.5%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE

  65 JT SEAL DMG    LOW         134 (SLABS)       50.85          2.00
  65 JT SEAL DMG    HIGH        130 (SLABS)       49.15         12.00
  74 JOINT SPALL    LOW           1 (SLABS)        1.00          0.60

      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD                RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY  RELATED DISTRESSES =  96.00 PERCENT DEDUCT VALUES.
  OTHER               RELATED DISTRESSES =   4.00 PERCENT DEDUCT VALUES.
```

```
Network ID      - LIBBY
Branch Name     - TOWER APRON                    SLAB Length  -   19.00 LF
Branch Number   - A4B                            SLAB Width   -   17.50 LF
Section Number  - 1    Family - DEFAULT    Number of Slabs   -   219


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  ------------------------------------------------------------------------
  Inspection Date: MAR/25/2002
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  ------------------------------------------------------------------------

  PCI OF SECTION =  95                                RATING = EXCELLENT

  TOTAL NUMBER OF SAMPLE UNITS =   10
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    5
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =    0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  4.6%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE

  62 CORNER BREAK   LOW           2 (SLABS)        1.00          0.70
  67 LARGE PATCH    LOW          10 (SLABS)        4.50          2.84
  73 SHRINKAGE CR   LOW           6 (SLABS)        2.70          0.83
  74 JOINT SPALL    LOW           6 (SLABS)        2.70          1.67
  75 CORNER SPALL   LOW           4 (SLABS)        1.80          0.78


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD                RELATED DISTRESSES =  10.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY  RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
  OTHER               RELATED DISTRESSES =  90.00 PERCENT DEDUCT VALUES.
```

```
Network ID      - LIBBY
Branch Name     - MAIN APRON                      SLAB Length  -   20.00 LF
Branch Number   - A5B                             SLAB Width   -   20.00 LF
Section Number  - 1    Family - DEFAULT    Number of Slabs    -   640


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  --------------------------------------------------------------------------
  Inspection Date: MAR/25/2002
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  --------------------------------------------------------------------------

  PCI OF SECTION =  94                                RATING = EXCELLENT

  TOTAL NUMBER OF SAMPLE UNITS =   30
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =   15
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =    0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  4.2%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE

  62 CORNER BREAK   LOW           2 (SLABS)        1.00          0.70
  63 LINEAR CR      LOW          16 (SLABS)        2.53          2.59
  66 SMALL PATCH    LOW          26 (SLABS)        4.11          0.47
  73 SHRINKAGE CR   LOW          99 (SLABS)       15.51          2.15
  74 JOINT SPALL    LOW           4 (SLABS)        1.00          0.60
  75 CORNER SPALL   LOW           8 (SLABS)        1.27          0.54
  75 CORNER SPALL   MEDIUM        6 (SLABS)        1.00          0.80

      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD                RELATED DISTRESSES =  42.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY  RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
  OTHER               RELATED DISTRESSES =  58.00 PERCENT DEDUCT VALUES.
```

```
Network ID      - LIBBY
Branch Name     - HANGAR APRON                    SLAB Length  -   15.00 LF
Branch Number   - A6B                             SLAB Width   -   12.50 LF
Section Number  - 1    Family - DEFAULT    Number of Slabs    -  912


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  ------------------------------------------------------------------------
  Inspection Date: MAR/25/2002
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  ------------------------------------------------------------------------

  PCI OF SECTION =  91                                RATING = EXCELLENT

  TOTAL NUMBER OF SAMPLE UNITS =   46
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =   18
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =    0
  RECOMMENDED MINIMUM OF    8 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  7.8%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE

  63 LINEAR CR      LOW          10 (SLABS)        1.11          1.19
  63 LINEAR CR      MEDIUM        8 (SLABS)        1.00          1.00
  65 JT SEAL DMG    HIGH        456 (SLABS)       50.00         12.00
  66 SMALL PATCH    LOW          15 (SLABS)        1.67          0.41
  73 SHRINKAGE CR   LOW          10 (SLABS)        1.11          0.70
  75 CORNER SPALL   LOW          15 (SLABS)        1.67          0.73
  75 CORNER SPALL   HIGH          5 (SLABS)        1.00          1.20

      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD                RELATED DISTRESSES =  13.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY  RELATED DISTRESSES =  69.00 PERCENT DEDUCT VALUES.
  OTHER               RELATED DISTRESSES =  18.00 PERCENT DEDUCT VALUES.
```

```
Network ID      - LIBBY
Branch Name     - WARM-UP APRON 26              SLAB Length  -   20.00 LF
Branch Number   - A7B                           SLAB Width   -   25.00 LF
Section Number  - 1    Family - DEFAULT    Number of Slabs   -   120


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  ------------------------------------------------------------------------
  Inspection Date: MAR/25/2002
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  ------------------------------------------------------------------------

  PCI OF SECTION =  92                              RATING = EXCELLENT

  TOTAL NUMBER OF SAMPLE UNITS =    6
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    4
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =    0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  4.5%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE

  66 SMALL PATCH    LOW           2 (SLABS)        1.25          0.31
  73 SHRINKAGE CR   LOW          56 (SLABS)       46.25          6.86
  74 JOINT SPALL    LOW           3 (SLABS)        2.50          1.63
  75 CORNER SPALL   LOW           2 (SLABS)        1.25          0.53


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD                RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY  RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
  OTHER               RELATED DISTRESSES = 100.00 PERCENT DEDUCT VALUES.
```

```
Network ID      - LIBBY
Branch Name     - WARM-UP APRON 26              SLAB Length  -   20.00 LF
Branch Number   - A8B                           SLAB Width   -   25.00 LF
Section Number  - 1    Family - DEFAULT    Number of Slabs   -   120


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  ------------------------------------------------------------------------
  Inspection Date: MAR/25/2002
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  ------------------------------------------------------------------------

  PCI OF SECTION =  97                              RATING = EXCELLENT

  TOTAL NUMBER OF SAMPLE UNITS =    6
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    4
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =    0
  RECOMMENDED MINIMUM OF   4 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  1.5%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE

  67 LARGE PATCH    LOW           1 (SLABS)        1.25          1.16
  73 SHRINKAGE CR   LOW          20 (SLABS)       17.50          2.39


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD                RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY  RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
  OTHER               RELATED DISTRESSES = 100.00 PERCENT DEDUCT VALUES.
```

```
Network ID      - LIBBY
Branch Name     - WARM-UP APRON 21         Section Length  -    125.00 LF
Branch Number   - A9B                      Section Width   -    100.00 LF
Section Number  - 1    Family - DEFAULT    Section Area    -  12500.00 SF

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  --------------------------------------------------------------------------
  Inspection Date: MAR/25/2002
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:              F.O.D.:
  --------------------------------------------------------------------------

  PCI OF SECTION =  69                              RATING = GOOD

  TOTAL NUMBER OF SAMPLE UNITS =    3
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    3
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    3 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  5.8%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE

  48 L & T CR       LOW           365.00 (LF)      2.92           9.84
  52 WEATH/RAVEL    LOW         12492.00 (SF)    100.00          26.35


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD                RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY  RELATED DISTRESSES = 100.00 PERCENT DEDUCT VALUES.
  OTHER               RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
```

```
Network ID      - LIBBY
Branch Name     - WARM-UP APRON 12         Section Length  -    400.00 LF
Branch Number   - A10B                     Section Width   -    140.00 LF
Section Number  - 1    Family - DEFAULT    Section Area    -  35000.00 SF

================================================================================

  --------------------------------------------------------------------------
  Inspection Date: MAR/25/2002
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:              F.O.D.:
  --------------------------------------------------------------------------

  PCI OF SECTION =  69                               RATING = GOOD

  TOTAL NUMBER OF SAMPLE UNITS =    6
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =     3
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  0.0%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE

  48 L & T CR       LOW         1235.00 (LF)       3.53          11.38
  52 WEATH/RAVEL    LOW        35000.00 (SF)     100.00          26.35


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD                RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY  RELATED DISTRESSES = 100.00 PERCENT DEDUCT VALUES.
  OTHER               RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
```

```
Network ID      - LIBBY
Branch Name     - WARM-UP APRON 30         Section Length  -    220.00 LF
Branch Number   - A11B                     Section Width   -    140.00 LF
Section Number  - 1    Family - DEFAULT    Section Area    -  30800.00 SF

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  ------------------------------------------------------------------------
  Inspection Date: MAR/25/2002
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:              F.O.D.:
  ------------------------------------------------------------------------

  PCI OF SECTION =  25                              RATING = VERY POOR

  TOTAL NUMBER OF SAMPLE UNITS =    4
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =     3
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  0.0%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE

  43 BLOCK CR       MEDIUM      30800.00 (SF)    100.00         53.01
  52 WEATH/RAVEL    MEDIUM      30800.00 (SF)    100.00         56.77



      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD                RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY  RELATED DISTRESSES = 100.00 PERCENT DEDUCT VALUES.
  OTHER               RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
```

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Fort Huachuca, Arizona

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13. SUPPLEMENTARY NOTES

14. ABSTRACT

An airfield pavement evaluation was performed in March 2002 at Libby Army Airfield, Fort Huachuca, Arizona, to develop information pertaining to the structural adequacy of the airfield pavements for continued use under its current mission and the upgrading of the pavements for mission changes. The pavement surface condition was evaluated using the Pavement Condition Index (PCI) survey procedure, and a nondestructive evaluation procedure was used to determine the load-carrying capability of the pavements and overlay requirements for continued use of the pavements under current missions. Results of the evaluation are presented including: (a) a tabulation of the existing pavement features, (b) the results of the nondestructive tests performed using a heavy weight deflectometer, (c) the PCI and rating of the surface of each pavement feature, (d) a structural evaluation and overlay requirements for 6,819 passes of the C-17 aircraft on Portland cement concrete and 6,243 passes of the C-17 aircraft on asphalt concrete, (e) the pavement classification number for each pavement facility, and (f) maintenance and repair recommendations based on the structural evaluation and condition survey.

15. SUBJECT TERMS

Aircraft classification number	Nondestructive testing
Allowable gross aircraft load	Pavement classification number
Libby Army Airfield	Pavement condition index

16. SECURITY CLASSIFICATION OF:			**17. LIMITATION OF ABSTRACT**	**18. NUMBER OF PAGES**	**19a. NAME OF RESPONSIBLE PERSON**
a. REPORT	**b. ABSTRACT**	**c. THIS PAGE**			**19b. TELEPHONE NUMBER** *(include area code)*
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